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A NOTABLE RAILROAD ELECTRIFICATION.

Switzerland has been the scene of so many notable feats in electric-power utilization that one is not at all surprised at new evidence of activity. An article published in our columns this week shows how the work of electrification of railways is proceeding in that country, unhampered by those obsessions of standardization that have blocked progress in some other countries that might be mentioned. The road in question is the Loetschberg line, which forms a part of the communication through the Alps to Italy, running from Spiez to Brigue, where it joins the Simplon line that reaches through the great tunnel to Milan. The line through the tunnel is, as our readers will remember, an electric one worked with three-phase locomotives, which have proved highly successful. The present system, in all 46 miles in length, is a fine example of heavy mountain work, devoted in the main to through traffic and having many severe grades and sharp curves. At present the completion of the line awaits the finishing of the Loetschberg tunnel, but one section is already in service and the steam locomotives have been replaced by electric ones. These are two in number at the start, one of 2000 hp and the other of 1600 hp. The larger of the pair, which we fully illustrate, is of more than usual interest as being a recent example of the best European single-phase practice. The best-known single-phase locomotives in this country are greatly handicapped by the necessity of a complete double equipment outside of the motors to meet the necessity of working on direct current at the terminus. Freed of this difficulty, the single-phase machine is much simpler in its connections and, in general, much more advantageous. The present example is a 90-ton machine, with twelve driving wheels under a pair of three-axle bogie trucks. The striking feature of the motor drive, well shown in one of the cuts, is the ingenious way in which one motor rigidly geared to a countershaft drives all three axles on its bogie by means of connecting rods. Every ounce of weight thus becomes available for traction, and it is not surprising therefore to find a drawbar pull rising to 28,000 lb.

The motors, on account of the nature of their work, are not designed for high speed, the maximum required being only 43.5 miles per hour and the ordinary running speed being only about two-thirds of this. Each motor weighs a little less than 10 tons, so that the output with respect to weight is excellent, and this advantage seems to have been gained without any material sacrifice in electrical qualities, since the motor efficiency is found to exceed 90 per cent at one-half to full load and the power-factor at anywhere near the normal speed is above 95 per cent. The motor voltage is about the same as in American practice, being 440 at the maximum; the line voltage is 15,000 and the periodicity 15. The overhead work is the customary catenary con-

struction, and the trolley the usual pantograph and bow. The details of the control seem to be very thoroughly worked out, and the whole equipment seems very business-like. The choice of the single-phase system for this mountain line is quite in accordance with recent foreign practice, the European engineers having with few exceptions looked with little favor on the third-rail equipment with its costly distributing system, especially since most lines so far electrified have been characterized by somewhat moderate traffic. What the European choice would be for fast trunk-line service remains to be seen, but we think it safe to predict that it would not include a direct-current feeding system. It is rather interesting to speculate, by the way, upon the probable effect upon electric traction should the high-output mercury rectifier be brought successfully through its experimental stage, as now seems quite likely. Would the third-rail brigade still stand by their intrenchments, or would they execute a sudden change of base and trust to outflanking the alternating-current hordes by working a transformation upon the locomotive itself? Certainly things would begin to happen in very short order. In any event, such a system as we are here considering is able to give a good account of itself in any company, for it is skilfully designed and executed in a most workmanlike manner

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APPROXIMATE METHOD OF DETERMINING POWER-FACTOR.

The usual method of measuring power-factors in single-phase circuits is to measure the volt-amperes by the product of the simultaneous readings of a voltmeter and an ammeter, and the watts by a wattmeter in the same circuit. The ratio of the watts to the volt-amperes is the power-factor of the circuit beyond the point of measurement. This method involves, however, the simultaneous use of a voltmeter, an ammeter and a wattmeter, each adapted in range to the particular conditions under observation. In the article which appears on page 273 Prof. C. M. Jansky points out a useful method of measuring power-factors on two-phase or three-phase circuits of properly balanced voltage, involving only the use of a pair of ammeters and the ratio of their simultaneous readings. With suitable switching connections a single ammeter inserted successively in two branch circuits can be made to serve, thus reducing the instruments required to one ammeter, the switches and two banks of lamps.

The principle of deriving any required difference in phase from two-phase or three-phase circuits in this way has been known for some time, having been first set forth in an article by Dr. Kennelly in our columns in the issue of Aug. 10, 1899, but its adaptation by Professor Jansky to the measurement of power-factors with a single ammeter is ingenious and seems to be new. It is not claimed, of course, that this double-ammeter method is more precise than the voltmeter-ammeter-wattmeter method, when carefully calibrated instruments are available; but that in small stations, with limited instrument equipment, it is much more probable that a suitable ammeter will be available than the three instruments of the ordinary test. Moreover, even if the three instruments are forthcoming, but are not in accurate calibration, it is likely that the ratio of two readings on one and the same ammeter will be more nearly correct than the ratio of one reading on a wattmeter to the product of an ammeter and a voltmeter reading. Incidentally, it may be observed that substantially the same plan may be carried out, with only a little more complication, by employing two successive readings of a voltmeter across resistances, instead of two successive readings of an ammeter in the circuits; so that the principle of the method may still be employed when a voltmeter, instead of an ammeter, is the only measuring instrument available. Watt-hour meters are held up to more rigid specifications of accuracy at the present time than they were expected to meet a few years ago. A commercial watt-hour meter registering under full load on a circuit at 50 per cent power-factor, or less, is placed at a considerable disadvantage, and it is behaving well if its indications are within 4 per cent of the truth under these conditions. Of course, carefully calibrated new instruments can, and do, register more precisely than this; but the instrument which has been long in service and has suffered some deterioration is the one apt to fail under such tests.

THE ENGINEER AND PUBLIC-SERVICE COMMISSIONS.

Three of the papers presented at the Chicago convention of the American Institute of Electrical Engineers showed the importance of the position occupied by the public-service commissions as intermediaries between the consuming public and the public-service corporations. In his presidential address Professor Jackson emphasized the need of a policy of fairness toward both interests, and the participation by the engineer in the future relations between the companies and the consumers upon whose patronage the former thrive, which latter point was reiterated later by Mr. John W. Lieb, Jr. Perhaps if there had been more engineering and less promotion and speculative banking in the affairs of these companies in the past, the public would not have been so insistent on rigorous legislation for the regulation of public-service corporations. However that may be, the established properties require now a wholesome character of business management, to which the engineer can contribute in a great and increasing degree, and the spirit of the times makes it logical for the engineer to assume a leading place in the management of public utilities. The questions of capital value and the life of materials, a collateral part of the study of depreciation, are in particular issues for the engineer and the accountant to meet, and they involve the very life of the companies. Among the complex relations with which the engineer and the commission are to deal, these two questions stand forth to demand earnest and just consideration. The full and frank public statements of financial results which Professor Jackson recommends will help in making fair decisions and a public spirit under which these questions will lose their threatening aspect.

In discussing at length the subject of appraisals, Mr. Byllesby makes a plea that the commissions be composed of men who are conversant with the business over which they hold jurisdiction. Some of the commissions have one member who has had practical experience in a branch of one of

the several classes of public utilities, but this is held to be inadequate representation, and the attempt to overcome the defect is generally limited to the employment of experienced assistants. In the make-up of the commissions it has been assumed, as a rule, that these bodies were constituted to protect the public from the ravages of the corporation; but since the corporation needs protection from certain elements of the public, the commission, whatever training its members may have had, should exact justice without partiality. One objection to service as a member of a commission is that the salary is usually smaller than that which can be secured from a corporation in a position of corresponding responsibility. Another is that tenure of office is uncertain whether the service rendered has been faithful or otherwise, and this consideration repels good men. New York State, for instance, has only recently furnished two examples of the retirement of thoroughly competent commissioners, one of whom was a specialist in transportation matters, to make place for political favorites. Still another reason, which we think ought to have no foundation in actual experience, is the idea that if a man leaves a corporation and goes to a commission, he is making unfair use of his experience and will harass corporate interests in the future. A competent man should be able to keep his self-respect and serve either the corporation or the commission, passing from the one to the other. Mr. Floy in his paper on depreciation wisely advocates the uniform use of terms and an equally thorough consideration of all phases of public-service problems. That this is a duty which engineers should not ignore every one who is familiar with current court and commission decisions will admit. The engineer and the corporation should not leave the study of principles entirely to the commission. Having a direct interest in the solution of the problems, they should investigate to the fullest extent that their means will permit, and by advocating reasonable and satisfactory courses they should lead, rather than be led by, the commissions.

WARM-WEATHER SUGGESTIONS.

The recent long-continued period of unusually warm weather over a large portion of the United States emphasized the fact that electrical energy offers a convenient method of alleviating summer temperatures in several directions. These advantages are exploited by the larger and more enterprising electric-service companies, but there are probably thousands of the smaller companies that do not measure up to their opportunities in pressing home to consumers—almost literally striking while the iron is hot—the warm-weather benefits that may be had by the public generally by the varied uses of electricity. Six weeks of summer still remain, probably, and now is the time for the plant manager to convince his present or prospective customer, while the recollection of temperatures of from 90 deg. to 100 deg. is still fresh in his mind, that he and his family, or his employees, can work or play with greater efficiency and comfort by taking advantage of electrical agencies. This is in particular an excellent time for the salesman to direct attention to the fact that, of all forms of commercial illuminants, electric lamps dissipate the least heat. The merchant should be in a receptive frame of mind just now to consider the tungsten cluster for his store rather than the gas "arc" or other forms of lighting; and after the recent "hot spell" the slight increase of cost—should there be any, and there may not be—may not look so formidable.

Ice was in almost unprecedented demand during the warm-weather period and the importance of methods of refrigeration also was greatly accentuated. In many localities there was fear of ice famine, and in numerous instances ice companies raised their prices 50 per cent or more. The ice situation is one to which the central-station company should give the most careful study. This journal has made an especial effort during the last two years to point out central-station possibilities in relation to ice-making and refrigeration. A mass of information has been presented which should be of especial value at the present time. Many electric-service companies may engage profitably in ice making direct. Others may find it more practical to sell electrical energy to outside ice producers. In addition, there is the supply of electrical energy to refrigerating plants, from the large systems used in warehouses and stores to the small domestic sizes adapted to houses and apartments. The probability of a notable electrical expansion in the direction of ice making and refrigeration seems to be most promising, and few, if any, central-station companies can afford to neglect to give the subject careful attention. Of course, the comforting electric fan has been an alleviator of summer weather conditions for many years, but this year the demand in cases far exceeded the supply, although unusual preparations had been made before the season began. Aside from the increase in connected load, the little rotary fan is one of the best possible advertisers of electricity. "You realize the convenience of the electric fan," says the enterprising solicitor; "why not use electricity also to drive the sewing machine or to operate a vacuum cleaner or a washing machine?"

Electric heating and cooking devices are particularly appreciated in warm weather. Consider that boon to housewives, the electric flatiron, making possible ironing on the porch, upstairs in the sewing-room, or in any place that is cool or convenient where an electric outlet is within practicable distance of a connecting cord. Parenthetically, this is a good season to call the attention of owners and architects to the advantages of baseboard outlets in new apartment buildings and residences. The convenience of the electric toaster and the electric coffee percolator are apparent for light summer breakfasts. The servant problem, when mistress and maid may have divergent vacation plans, is often more acute in summer, and electrical domestic conveniences may enable the woman of the house to dispense with an unsatisfactory servant during the lighter household demands of the warm months. To electrical men there is nothing novel in the recital here presented. But we are convinced that very many electric-service companies do not make the most of their warm-weather opportunities. If this belief is correct, the present propitious season is the time to begin a local campaign in hundreds or thousands of American cities and villages, when Old Sol has softened the possibly hitherto refractory disposition of the prospective customer.

Members of Wire Manufacturers' Associations Fined.

On July 25 Judge Archibald, of Pennsylvania, sitting on the criminal bench of the United States Circuit Court of New York, disposed of the cases against the members of the seven wire manufacturers' associations who were indicted on June 29 for combination in restraint of trade. A fine of $1,000 was imposed for one indictment against each member and $100 for each additional indictment, the individual fines thus ranging from $1,000 to $1,700. When the case was called thirty-seven of those indicted and present entered pleas of *nolo contendere,* those who had originally pleaded not guilty substituting this plea. Most of the remaining eighty-three men who were indicted on June 29 are abroad, and it is understood that these and others now on vacation will, as they return home, enter the same plea and be subjected to the same fine.

United States District Attorney Wise opposed the reception of the plea offered, stating that under general legal practice the plea of *nolo contendere* is in the nature of a compromise between the District Attorney and the defendant and that such a compromise had not been entered into in the present cases. "Here are," he said, "a group of men who represent practically the entire industry in this country—practically 95 per cent of that industry—who have entered upon an agreement which upon its face was as clear a violation of the law as has ever come before me. I do not wish it to appear that the District Attorney has a part in this agreement, and I am not willing to have this precedent established in this court. *Nolo contendere* is a plea accepted in mild misdemeanor cases, while the offense here is punishable as a felony."

In reply Judge Archibald said that the plea *nolo contendere* is a well-established plea. "It results in a sentence, and in that respect entirely fulfils the law. All the government asks is that the law shall be vindicated and the sentence shall be appropriate to the offense. I do not understand that the plea represents any compromise between the government and the defendants. It is virtually a concession so far as results are concerned." The plea was then ordered to be entered, and in passing sentence Judge Archibald said:

"This is what you might call a trade offense. It is an offense which by an act of Congress is against the interests of the business world. Congress has declared that combinations in restraint of trade shall not exist. It seems to me that I am not going out of the way when I say that just what is meant by this law has remained in considerable uncertainty up to this time. We now know exactly, or very nearly, what it means, and from this time on there will be no excuse; but I feel justified in looking upon what has occurred in the past in this light, and, therefore, I certainly regard this as calling for nothing except a proper vindication of the law by a fine. The extent of that fine is somewhat difficult for me to fix, but it should be a substantial fine and I will impose $1,000 in this case on each defendant. Let him pay the costs and a fine of $1,000 in this case. I cannot bring myself to put a fine of $1,000 in each of these cases where the defendant has pleaded and been sentenced to a fine of $1,000, and in the second case I shall modify it to $100."

New Bureau of New York Edison Company.

To the already large number of bureaus established by the New York Edison Company for the purpose of increasing the efficiency of its service there has just been added a Bureau of Large Building Oversight, organized primarily for the purpose of bringing about an economy in consumption by large users of the electric light.

A corps of men will be maintained who will do nothing but keep a general supervision over the manner in which electricity is used in large buildings. They will see that lamps are not left burning when they are not actually required, will keep oversight that an economical lamp which has burned out is not replaced with a lamp that has less efficiency, and wherever possible will recommend changes in the style of lamps used in order that the customer may effect a reduction in his lighting bills.

It often happens that when a private generating station has been closed down the New York Edison Company installs a complete equipment of tungsten lamps. It then begins to educate the owners and tenants in the ways of economy. Often the lesson is a hard one to teach, for in the days of the private plant it made very little difference whether a lamp burned all night and whether several lamps burned when there was really no need for them. There was a fixed sum appropriated for the maintenance of the plant and a few lamps more or less made little difference. Tenants, of course, used electricity on an extravagant scale. With the electricity to be paid for at so much per kw-hour it has made all the difference in the world whether the lights were turned off when not required or were left burning. When the cost of energy used was compared with the cost of maintaining a plant the central station was bound to appear in an unfair light.

With the new bureau it is expected a great change will be brought about. The "economy men" will spend their time in the buildings, and as has been said before will see that lamps are promptly switched off when there is no need for them. They will also take care that carbon lamps are not substituted when a tungsten lamp burns out, and will make whatever suggestions may seem practicable as to the arrangement of lighting fixtures. They will take daily meter readings for charting as a record to show the consumption from day to day, the weather conditions as to light and darkness being also recorded.

Economy men are now keeping the record of current consumption in the American Surety Building, 100 Broadway; the Holland House, at Broadway and Thirtieth Street; the Lotos Club, in Fifty-seventh Street, and Murray's Restaurant, in Forty-second Street.

Electrical Laboratory Equipment of the New York Public Service Commission, Second District.

Among the apparatus in the electrical laboratory of the New York Public Service Commission, Second District, is a double motor-generator set for obtaining alternating current of various frequencies and power-factors, consisting of a 40-cycle induction motor driving two shunt-wound, direct-current generators. These generators are each controlled by a Tirrill regulator. One of the generators supplies current for all fields, while the other supplies current for the armature of a direct-current motor which drives the second unit. This latter consists of the shunt-wound, direct-current motor mentioned, which drives three alternators. Two of these alternators are four-pole machines, one rated at 110 volts and 220 volts, three-phase; the other 15 volts, three-phase. The rotors of these machines are keyed on the shaft in the same position. The stator of the 110-volt machine is movable with respect to the rotor, and by exciting the potential coils of wattmeters from that machine and the current coils from the 15-volt machine an artificial power-factor may be obtained for testing purposes. The third machine is an eight-pole, single-phase generator. The speed of the second unit may be altered from 650 r.p.m. to 2400 r.p.m. by altering the field or armature excitation on the direct-current motor, which gives any frequency from 22½ cycles to 140 cycles. There is also a control switchboard for this set equipped with frequency indicators and voltmeters.

Two sets of batteries are used for testing purposes, one rated at 15 amp, eight-hour discharge, 20 volts; the other at 160 volts, ¾ amp. These batteries are charged from a

mercury-arc rectifier panel operated from the 40-cycle supply service of the Municipal Gas Company. The commission has, also, as laboratory instruments, a General Electric potentiometer with galvanometer, lamp, scale, volt box and resistances; six Weston standard cells; one Weston laboratory standard voltmeter with resistances, and one Westinghouse precision wattmeter, range 5 amp to 100 amp. The secondary standards include wattmeters, millivoltmeters and shunts, and ammeters. A decade box is used in measuring resistances. The entire cost of this equipment was about $7,000.

Convention of Ohio Electrical Association.

By Telegraph.

The seventeenth annual convention of the Ohio Electric Light Association was opened by President E. H. Beil, of Youngstown, Tuesday afternoon, July 25, at beautiful Cedar Point on Lake Erie. A 40-mile gale on the lake during several days preceding the convention had somewhat interfered with the passenger schedules of lake vessels, and acted to withdraw most of the water from Sandusky Bay, so that the Cedar Point ferries were for a time unable to run, lending a touch of adventure to the experiences of those who arrived for the first day of the sessions. The registration the first day was 350.

In his official address, after referring to the arrangements for the convention, President Beil spoke of the strength of the Ohio Association, which now numbers ninety-three active members, out of 160 central-station companies in the State, and eighty-two associate members. Touching on the legislative enactment converting the State Railroad Commission into a body with powers to regulate all public utilities, the speaker declared that, while the State law is not all that the companies might desire, it nevertheless contains many fair provisions.

Major C. B. Wilcox, of the Sandusky Gas & Electric Company, welcomed the convention to Cedar Point in a gracious speech, which he closed with a reference to the at first slow, but now rapid, growth of the electrical art, concluding with the advice that the public should receive more enlightenment on central-station problems. Wherever trouble occurred between the public and corporations this may be traced, declared Major Wilcox, to the public's lack of understanding of the problems of the latter, and he urged the association to prosecute a vigorous campaign of education.

The report of Secretary D. L. Gaskill, of Greenville, rendered an itemized account of treasury transactions showing a substantial balance to the credit of the association. The secretary also presented the names of a number of new members and commended the work of the president and committees of the association.

In his paper entitled "Why the Central Station Should Take Over the Isolated Plant" Mr. Waldo Weaver, chief engineer for the Detroit-Toledo interurban railway, pointed out the limitations of isolated-plant operation and the superior advantages in economy, reliability, convenience and safety of central-station service. The subject of replacing isolated plants was further discussed by Messrs. B. H. Gardner, of Dayton; C. I. Crippin, of Youngstown; D. L. Gaskill, of Greenville, and W. C. Anderson, of Canton. Mr. O. B. Reemelin, of Dayton, then presented his paper on "Record Systems for Modern Central Stations," which included reproductions with explanations of the various blank forms used in the work of the Dayton company, covering customers' data, inspection permit, service order, pole records, meter orders, transformer records, meter records, complaint sheets, etc. The subject of orders was further discussed by Mr. J. T. Kermode, of Cleveland, and Messrs. J. G. Gilmartin, of Toledo; C. C. Smith, of Bradford, and J. C. Martin, of Wilmington, recounted their own practice in removing service drops when disconnecting premises.

On Tuesday afternoon the ladies were entertained at a musicale and card party at "The Breakers" hotel, and in the evening there was an informal dinner tendered all members of the convention, followed by dancing. Dips in the lake provided diversion for all during odd hours. A number of elaborate exhibits were arranged by the manufacturers in the building where the sessions were held, and a feature of this display of electrical apparatus was the booth of the meter committee, of which Mr. J. G. Gilmartin, Toledo, is chairman. A wide assortment of electrical measuring instruments was shown and attendants were on hand to explain their use to inquirers.

The session of Wednesday morning, with Vice-president W. C. Anderson, of Canton, in the chair, was opened by Mr. J. T. Kermode, of Cleveland ,who presented a paper entitled "Application of Mercury-Arc Rectifiers Installed on Central-Station Lines," which was discussed by Messrs. G. H. Stickney, R. E. Russell and W. S. Culver, of Schenectady, N. Y., and W. C. Anderson, of Canton. Mr. A. M. Seeger, of Toledo, next read a paper entitled "Limiting the Energy Demand and Voltage Variations of a Circuit by Floating a Flywheel Motor-Generator on the Line," reporting the results of operating such a set in connection with the Toledo ore-dock unloaders, described in the issue of the *Electrical World* dated Feb. 23. The paper was discussed by Messrs. O. H. Hutchings, of Dayton; W. S. Culver, W. C. Anderson, J. G. Gilmartin, J. T. Kermode, T. I. Buckwell, of Toledo, and W. C. Anderson. Mr. G. A. Doeller, of Dayton, closed the morning's program with a paper on "Boulevard Lighting Systems," in which methods of arc and incandescent street lighting were described, typical installations being cited and forms of agreement for such lighting reproduced. This paper was discussed by Messrs. G. H. Stickney, W. S. Townsend, of East Liverpool; D. L. Gaskill, W. D. H. Garner, T. D. Buckwell and C. S. Davidson, of Newark.

The chairman of the committee on motors, Mr. B. H. Gardner, submitted a report calling attention to the interesting characteristics of the new unity power-factor Wagner single-phase motor, which was described in the *Electrical World* in the issue of June 1. Mr. C. N. Jewett, of St. Louis, Mo., also discussed this device. During Wednesday morning the ladies of the convention were entertained at a bowling party and in the afternoon were taken for a launch ride on Sandusky Bay. Later the central-station men challenged the associate members present to a ball game, and in the evening an informal banquet was tendered to all members of the convention in the dining hall.

Another Report Coming on St. Louis Rate Situation.

Mr. W. J. Hagenah, chief statistician for the Wisconsin Public Service Commission, who recently served as expert for the city in the Chicago telephone and gas rate controversies, has been engaged by the Union Electric Light & Power Company, of St. Louis, to make a study of its property investment and operating costs, bearing upon the determination of a fair and equitable schedule of rates for the sale of electric energy in St. Louis.

As has been reported in these columns, the Union Electric Company is now contesting a recent city ordinance limiting its charges to 9½ cents per kw-hour. This ordinance will become effective in October, six months from the date of its signing last April, but by a clause in the enabling act creating the St. Louis Public Service Commission the company has availed itself of its right to appeal and a review of the case is promised for the fall term of the local circuit court. The company declares that the

rate fixed is too low and is disproportionate to the actual cost of delivering the service. The status of the ordinance is also to be attacked on legal grounds. Meanwhile Mr. Hagenah and his corps of assistants are now in St. Louis studying the valuation of the company's property, its operating costs, rates, etc., and the findings resulting from this investigation are promised in a report to be made public about Sept. 1.

Toledo Rate Situation.

Judge Johnson in the Common Pleas Court at Toledo, Ohio, has overruled the demurrer of the Toledo Railways & Light Company to the petition of the city for the enforcement of an ordinance fixing the rate to consumers at 8 cents per kw-hour, with a discount of 1 cent. Judge Johnson said that the court cannot compel the company to accept that rate, but that it must either accept it or give up the use of the streets. It can withdraw from the city whenever it pleases, but so long as it occupies the streets it must conform to such regulations as the city may make so far as the rate is concerned.

It seems that the court overruled the company in almost every material contention. Its demurrer was based upon the ground that an action of this kind cannot properly be brought before a court of equity and that the petition and ordinance did not constitute an adequate cause for action. The court held, however, that it retained its jurisdiction in cases involving the validity of ordinances regulating public utilities which were passed before June 30, 1911.

The court held the contention of Attorney Barton Smith that the discount of 1 cent is illegal to be unsound. The fixing of a discount, he said, is part of proper rate regulation. The court, however, expressed some doubt as to the city's rights to fix a minimum payment of 50 cents a month and require the company to furnish meters free of charge. The city will, therefore, ask for a restraining order to prevent the company from charging more than 8 cents per kw-hour, with a discount of 1 cent, until the final hearing of the case, which will not take place for about six weeks.

Attorney Barton Smith assured the court that no consumer's service will be discontinued because of insistence on the payment of the rate fixed by the city, but that receipts will not be given for payment in full of the bills. The payments will be credited on account pending the final termination of the suit.

Ohio Public Utility Law.

At the meeting this week of the Ohio Electric Light Association Mr. D. L. Gaskill, secretary of the association and president of the Greenville (Ohio) Electric Light & Power Company, presented a paper entitled "The Utility Law of Ohio and Its Application to Electric-Light Companies," which gives an analysis of the provisions of the act.

In opening, Mr. Gaskill pointed out that the Ohio Electric Light Association was probably the first body of its kind to recognize the desirability of a utility law properly drawn and administered, and controlling the public functions exercised by public-service corporations of the State. Upon invitation eleven years ago one of the Massachusetts Public Service Commissioners addressed the association, then in session in Cincinnati, and later some effort was made by its officers to procure public-service legislation modeled somewhat after the Massachusetts law. The central-station men of Ohio were then willing to give the State control of the rates and service in return for protection from ruinous and sometimes dishonest competition, but the public was not at that time sufficiently educated in the matter of public-utility regulation. In taking up the Ohio public-utility bill recently passed, Mr. Gaskill declared that while of some benefit both to the public and to the central stations, it is far from satisfactory owing to much of it being "the handiwork of the demagogue and lobbyist."

The Ohio Public Service Commission consists of four members, who are prohibited from being in any way interested in any public utility, a provision which Mr. Gaskill says will generally insure inexperienced men poorly fitted for the offices they are to fill. The members are given power and jurisdiction to supervise and regulate public utilities and to regulate the mode and manner of making all tests, valuations and inspections, all their investigations and hearings being open to the public. They have the right to examine any official, employee or agent of any utility under oath and to invoke the authority of any Common Pleas judge to compel the giving of testimony upon any matter upon which he may be lawfully interrogated; to examine all books or contracts or records of any utility; to examine and keep informed of the condition of any utility, its capitalization, management, franchises, accommodations afforded by its service to insure the safety and security of the employees and the public; to have oversight of the manner of carrying out the terms of its franchises and charter requirements; to require any public utility to file with the commission any contract which it may have with any other public utility relating in any way to the business; to establish and classify a system of accounts to be kept by the public utility and to prescribe a form, and may order changes at any time in any accounts that are being kept either in form or in the items thereof.

Section 14 provides that "Every public utility shall furnish necessary and adequate service and facilities which shall be reasonable and just, and every unjust or unreasonable charge for such service is prohibited and declared to be unlawful," while Section 15 provides that "Every public utility shall furnish with respect to its business such instrumentalities and facilities as shall be adequate and in all respects just and reasonable. All charges made or demanded for any service rendered shall be just and reasonable and not more than allowed by law or by order of the commission. Every unjust or unreasonable charge made for any service, or in connection therewith, or in excess of that allowed by law or by order of the commission, is prohibited and declared to be unlawful."

These sections, Mr. Gaskill says, are sweeping in their nature. What is necessary and adequate service is a very much disputed question. What would be adequate service for one would be entirely inadequate for another, and what would be reasonable in some conditions would be unreasonable in others. It is probable, however, that the commission will apply these two sections in a spirit of fairness rather than on a level, arbitrary rule which would suit no one and work irreparable injury.

Section 16 provides that no public utility shall directly or indirectly, or by any special rate, rebate, drawback or other device or method, charge any person a greater or less compensation for any services rendered, except as provided in the act, than it charges any other person for doing a like and contemporaneous service under the same circumstances and conditions. Nor shall free service or service for less than actual cost be furnished for the purpose of destroying competition. Section 19 provides that nothing in the act shall be taken to prohibit a public utility from entering into any reasonable arrangement with its customers or employees for the division or distribution of its surplus profits or providing for a sliding scale of charges; or providing for a minimum charge for service to be rendered, unless such minimum charge is made or provided for by the terms of the franchise or ordinance under which such public utility is operated; or prohibit a classification of service based upon the quantity used, the time when used, the purpose for which used, the duration of use, and any other reasonable consideration; or

providing any other financial device that may be practicable or advantageous to the parties interested. No such arrangement, sliding scale, minimum charge, classification or device shall, however, be lawful unless filed with and approved by the commission. Every public utility is required to conform its schedule of rates, tolls and charges to such arrangement, sliding scale, classification or other device, which arrangement shall be under the supervision and regulation of the commission, and subject to change, alteration or modification by it.

These two sections Mr. Gaskill considers of positive benefit to the central stations of the State in that they give a valid argument against a party who insists upon a special rate, and allow any reasonable classification of business so that competition can be made upon a fair and even ground.

While under Section 18 rates in force July 1, 1911, must be filed with the commission by Oct. 1 and a printed copy of such rates shall be placed in such manner as the commission may order, Mr. Gaskill is of the opinion that this need not be done until the commission actually makes the order that it shall be done.

Section 20 prohibits any discrimination in a class or schedule adopted for any particular class of business, which prohibition, Mr. Gaskill says, extends to the utmost limits of imagination; and where discounts have been allowed for the payment of bills within a specified time these discounts must be enforced or else done away with entirely. That is, if the ten days have expired, where such a rule is in force, no discount can under any circumstances be allowed if payment is made after said period has elapsed.

Where contracts have been made and are not terminable by notice they may be carried out. Where rates have been filed and it is desired to change the same it may be done by giving thirty days' notice to the commission. New schedules must be filed, but the consent of the commission is not required to make such change. Where, however, complaint is filed against any rate by any one or upon the initiative of the commission the utility shall have fifteen days' notice and thereafter a hearing had upon the complaint. After the hearing the commission shall make such order as it believes to be proper, taking into consideration the value of the property of the utility under consideration, excluding the value of the franchises, but including the amount needed for surplus, depreciation and contingencies and all other matters that should be considered proper expenses and charges in the operation of the utility, and after considering all these things, fix a proper rate to be charged by the utility. A rehearing is provided for upon the application of either party, and the costs may be apportioned or adjusted against either party at the option of the utility commission.

Mr. Gaskill believes it is reasonable to expect that central stations will experience little interference with their rates from these hearings, if any are held, as the nature of the business is such that where interest upon the investment, surplus, depreciation and the thousand and one expenses incidental to the operation of an electric-light property are taken into consideration by the commission they will have to find, in all fairness, that the rates as charged throughout Ohio are too low to provide for all these items. He concludes that it is probable that central stations will experience little trouble from this direction, especially if the commission is filled by men of good judgment and sound discretion.

Commenting on Section 30, which provides that the commission may after a hearing order such improvements and repairs to a public utility as will promote the convenience and welfare of the public, Mr. Gaskill asks what would happen if the commission should make such an order and the utility should be financially unable to carry it out, and adds that this section will probably be observed more in the breach than in its fulfilment.

Section 45 provides for a rehearing upon any order made if application for the same is made within thirty days from the time the order is made, and additional evidence may be brought out at such hearing. Section 46 provides that the council of any municipality may at any time within one year from the expiration of a contract heretofore made fixing the rate at which the utility would sell its product proceed to fix such rate; and if unsatisfactory to the utility, it may within sixty days file complaint before the commission, or if unsatisfactory to the electors of the municipality, 1 per cent of the same may file complaint in such time and a hearing shall be had thereon after thirty days' notice. If the rate fixed by the council is considered by the utility as satisfactory and it has accepted the same, then 3 per cent of the electors may within sixty days file a complaint upon which the usual hearing will be given. The filing of a complaint by a utility shall be held to be a consent of the utility to continue to furnish its product during the entire time fixed by the ordinance after the hearing is had thereon. Mr. Gaskill says that this section was due to the natural gas companies and will be declared invalid as soon as the courts get at it. Where complaint is made to the commission by the utility of a rate fixed by the council, it may elect to charge the rate in force immediately prior to the new rate so fixed, but an undertaking must be given to refund to the consumers the overplus charged if the complaint is decided against the utility. Mr. Gaskill's comment is that about the only comfort to the electric-light companies of the State in this section is a provision for an appeal, for it is to be presumed that the commission, being required to take into consideration all the elements that enter into the cost of operating a station, will allow a fair and adequate rate to companies for service.

Section 50 of the law provides for an annual report to be made by every utility which report shall cover any subject desired by the commission. Mr. Gaskill believes that if prepared by technical experts with no particular knowledge of the business reports may be expected similar to that required by the Tax Commission of Ohio, which consumed a good part of the time of the central-station men during all the last winter and spring to make out, and he suggested that the association appoint a committee to present its views to the Utility Commission, as it is possible that the commission would welcome suggestions as to what should be covered in the report.

Section 52 provides that every utility shall carry a proper and adequate depreciation or deferred maintenance account, unless the commission, after investigation, shall determine that a depreciation account cannot be reasonably required. This requires affirmative action on the part of the commission and the present system of accounts need not be changed until it makes such order. When made, Mr. Gaskill says, the commission should immediately determine what shall be proper and adequate charges for the depreciation of the several classes of property for each public utility, the charges to be such as will provide a sufficient sum over and above the costs and expenses to maintain and keep the product of the public utility in a state of efficiency corresponding to the art or industry. If a narrow or strict construction is placed upon this provision every electric-light company will, he believes, eventually be compelled to quit business or to give such service as will cause the commission to put it out of business under the adequate-service clause of the law. To central-station men it is a well-recognized fact that depreciation on different classes of property is radically different. Under a strict construction of this clause the commission might fix different rates of depreciation and consequently different funds for each particular class of equipment, such as electrical, steam, buildings, pole line, etc., and the central station would be prevented from drawing on any one of these funds to take care of any equipment needed in any other class. As an example, one might

have ample funds in the steam-equipment depreciation fund, but would have to borrow on short-time notes to pay for equipment needed in the electrical department. Still more startling is the requirement that the depreciation fund must be fixed at an amount that will provide sufficient over and above the cost and expense of maintenance to keep the property of the utility in a state of efficiency corresponding to the progress of the art or industry. The progress of the electrical industry is so very rapid that a station is scarcely completed when it is time to tear it down and rebuild, and if limited to the amount that must be set aside in the depreciation fund progress of the industry will stop. Progress means increase in business as well as improvements in methods, and any amount that the commission would fix as a proper depreciation charge would be much less than would be required to keep up with the progress of the industry. The hope is expressed that the commission will take a broad view of the whole situation and arrive at a rate that will be just and equitable, and that the depreciation fund created may be used for new construction, extension or additions, or for renewing, restoring, replacing or substituting depreciated property in order to keep the plant in a state of efficiency.

Section 53 gives an appeal to the commission from an order of the council ordering or requiring extension of lines, and after hearing upon such an appeal the commission may confirm the order of the council or may set it aside, after taking income and the costs of such extension into consideration.

Section 58 permits utilities to borrow money on notes not running longer than one year without the consent of the commission. This is about the only act, Mr. Gaskill says, that can be done without first getting consent. Provision is made for consolidation of utilities by the consent of the commission, but, except as to telephone companies, there is no provision in the law which will prevent the establishment or granting of franchises to competitive companies, whether honest or otherwise, without the consent of the commission.

Section 72 provides that any public utility dissatisfied with an order of the commission fixing or confirming any rate or any regulation, practice, act or service, or any finding, determination or requirement of the commission, may commence an action in the Common Pleas Court of Franklin County, Ohio, or in any county in which is located the principal office of the public utility, within sixty days after such order is made, against the commission as defendant, to vacate and set aside such order on the ground that it is unlawful or unreasonable, in which action summons may be issued in any county in the State and there served upon the adverse party. If such action is taken the commission shall cause a certified transcript of all proceedings had and the testimony taken to be filed with the clerk of the court of the county in which such action is pending and file its answer, and on leave of court any interested party may file answer within ten days after service. Such action has precedence over civil cases of a different nature pending in such court, and shall be tried and determined as are other civil actions, and a party may introduce original evidence in addition to the transcript of the evidence offered by the commission. If upon the trial of such actions the evidence introduced by the plaintiff is found by the court different from that offered upon hearing before the commission, or additional thereto, the court before rendering judgment shall transmit a copy of such evidence to the commission and stay proceedings in the action for fifteen days from the date of such transmission. Upon receipt of the evidence the commission shall consider it and may alter or modify its rulings and shall report its action to the court within ten days. If the commission rescinds the order complained of the action shall be dismissed, and if it alter or modify the order the judgment shall be rendered as though made by the commission in the first instance within sixty days after the judgment of the court. Either party may appeal or take the case up on error as any other civil action and be heard as other civil causes upon the calendar.

The penalties for disobedience to the orders of the commission are severe. Any officer or employee who violates or wilfully fails or neglects to obey the lawful orders of the commission is subject to a fine of from $100 to $1,000 or imprisonment of not more than two years.

In conclusion Mr. Gaskill says that, taking the law as a whole, it is a disappointment to the utilities. It does not protect from competition, but regulates services and rates. It is, he considers, unfair in its provisions and will have to be amended before it will either protect the consumer or the utility. It will be well to remember, he says, that it was intended for the benefit of the politician at election time rather than the public, and that in its application its teeth may be found to be less sharp than its language would indicate.

New York Commission News.

The Public Service Commission, Second District, is in receipt of an application for approval of consolidation under the name of Upper Hudson Electric & Railroad Company of the Schoharie Light & Power Company, the Catskill Illuminating & Power Company and the Upper Hudson Electric & Railroad Company, the consolidated company having an authorized capital stock issue of $500,000 and intending to execute a mortgage securing an issue of bonds in the amount of $1,000,000. The application, if granted, will tie together in one system of service the village of Catskill and the hamlet of Leeds, now supplied with electricity by the Catskill Illuminating & Power Company; the Catskill Mountain district comprising the communities of Schoharie, Hunter, Tannersville, Onteora Park and Haines Falls, now supplied with electricity by the Schoharie Light & Power Company, and the villages of Coxsackie, Ravena, Coeymans and Athens, now furnished with electric service by the Upper Hudson Electric & Railroad Company.

It is also proposed to include in the consolidated company the work, system and franchises of the former Cairo Electric Light & Power Company, which is dissolved and whose property recently was sold at a receivers' sale to the Schoharie Light & Power Company. As part of the application the Schoharie Light & Power Company asks for approval to consummate the contract of purchase and to pay for the property with the stock and bonds of such consolidated company when issued, the purchase price being $80,000, the amount of the capital stock of the Cairo company formerly outstanding, and in addition the consolidated company to assume a bonded indebtedness of the Cairo company in the amount of $80,000.

Of the authorized capital stock of $500,000, the consolidated company asks approval of the issue of $330,000 stock, 40 per cent of which shall be distributed pro rata among the holders of the capital stock of the Upper Hudson Electric & Railroad Company; 38 per cent among the holders of the capital stock of the Schoharie Light & Power Company, including the equity in the property of the Cairo Light & Power Company; and 22 per cent among the holders of the capital stock of the Catskill Illuminating & Power Company. This proposed issue of stock does not exceed in par value the aggregate capital stock at present issued and outstanding of the constituent companies, including the equity in the Cairo company.

Under the mortgage securing the issue of $1,000,000 bonds the consolidated company asks leave to issue bonds in the amount of $420,000, of which $297,000 bonds will be used to refund the outstanding bonds of the constituent companies in the same amount; $84,000 to discharge the floating indebtedness of the constituent companies, and the

balance of the proceeds to the extent that same may be available to meet expenses of organization, discounts and other contingencies.

At an informal hearing of the Public Service Commission, First District, a representative of an electrical audit and rebate company, appearing for a wholesale customer of the New York Edison Company, stated that his client had not been notified by the New York Edison Company of the issuance of a new form of contract, and claimed that, having been kept in ignorance of the new rate, the customer was entitled to a rebate for a period which dated from the time the change of contract was made. After hearing further testimony from both sides, Commissioner Maltbie reviewed the fact that the Public Service Commission issued an order several years ago requiring every electrical corporation within the First District of New York to standardize, publish, file with the commission and post in every office of the corporation where contracts are made a full and complete list of all rates, forms of contract, riders, etc. The commissioner stated further that the purpose of this order was that every customer who wished to take reasonable care could make inquiry at any office of the company or at the office of the commission to ascertain the rates that were in effect and determine for himself what rates were adapted to his circumstances. In the case in point it was ruled that the complainant had reasonable opportunity to ascertain the rates in effect from the beginning of the time claimed for rebate, and that if he did not secure the best rate, for the present conditions, he was responsible for such failure.

Application has been made by the Wynantskill Hydro-electric Company for permission to begin construction of an electric power plant at Wynantskill Creek, in the town of Sand Lake, for authority to exercise franchises within that town and for permission to issue $7,500 capital stock. Within the vicinity of Wynantskill there are many villages and summer resorts which the company proposes to supply with electricity for light anl power purposes. Some of the communities which it intends to serve are West Sand Lake, Snyder's Lake, Reichard's Lake, Averill Park, Sand Lake, Crooked Lake and Burden Lake. At the present time electric service can only be secured by these communities from Troy. The company now has contracts for the supplying of over 400 lights.

A hearing will be given on the application of the Rockland Light & Power Company for authority to issue $100,000 in 5 per cent mortgage bonds. With the proceeds the company intends to pay for extensions to its gas-distributing system to the villages of South Nyack, Grand View and Piermont, purchase a gas holder and an auto truck, construct reservoir and cooling plant at its Orangeburg plant and also install additional electric equipment.

Maryland Commission News.

The Lawrence Coal Company has complained to the commission that the service it is receiving from the Maryland Telephone Company is very poor and there seems to be no disposition to remedy it. The commission asked for an explanation and the telephone company replied that the Lawrence company's telephone was out of service in June on account of cable trouble due to storm damage and that the trouble was repaired June 28; the line was then in service until July 12, when it was again in trouble and was repaired July 14.

The commission last week began an investigation to determine the reasonableness of the prices which are being charged by the Consolidated Gas, Electric Light & Power Company. The next hearing will take place within the next sixty days, at which time the representatives of the company will be expected to file answers to a long list of interrogatories from the commission, which asks for information regarding everything connected with the capitalization of the company and the cost and distribution of both gas and electricity. City Solicitor Edgar Allan Poe was present at the meeting of the commission to represent the city of Baltimore, and former State Senator Putzel represented the association which filed the original complaint relative to the alleged discrimination between the prices which the company charges for electricity when furnished to small and when furnished to large consumers. Stating that it is strictly a business matter and that it should be handled by business men, the company dispensed with the services of its various attorneys, and Vice-president Charles M. Cohn, who is in charge of the gas division of the company, and Vice-president Herbert A. Wagner, who is in charge of the electrical division, will handle the entire matter for the company. Mr. Wagner made a statement to the effect that it is the policy of the company to make reduction in the prices of its various commodities whenever it is justified in so doing, and that it will be glad to furnish the commission with all the information in its possession showing just when reductions can be made. He also defended the prices at which electricity is furnished to small consumers, and said that charges for this branch of service are based on a reasonable return for the service involved, coupled with the cost of producing and distributing energy. He was very emphatic in saying that it was absolutely unfair to attempt to determine the reasonableness of the price of electricity by the cost of production, as many other things must be taken into consideration. Following is the information requested by City Solicitor Poe:

Present capitalization of the Consolidated Gas, Electric Light & Power Company. Gross receipts from sale of gas for the year ended July 1, 1911. Gross receipts from sale of electricity for the year ended July 1, 1911. Cost during said period of manufacturing and distributing gas. Cost during said period of manufacturing and distributing electricity. Amount of gas supplied by the Maryland Steel Company and the cost of same. Price at which electricity is supplied to the company by the Susquehanna Power Company. Market value of the bonds and stocks of the various component companies prior to consolidation and the par value of the same. Amount expended since final consolidation on mains, service pipes and other property used in supplying gas. Amount expended since final consolidation of the electrical service of the company.

The following information was asked for by the accounting department of the commission:

History of the formation of the Consolidated Gas Company, giving the names of constituent companies, the amount of the capital stock, and funded and unfunded debt of same. What property was taken over with the constituent companies, the amount of capital stock and funded debt of the new company, showing the amount of new securities issued and how these securities were distributed and to whom they were issued. History of the formation of the Consolidated Gas, Electric Light & Power Company, giving same information as called for regarding the Consolidated Gas Company. Capital expenditures for the last five years. Increase of capital stock and funded debt in the last five years. Revenue and expenses for the last five years, each being set up separately. The output and sales of gas and electric energy during the last five years, this to show quantities made, used and sold, and cost of production, also kind and quantities of materials used in production.

The following is a summary of the information asked for by the engineering department of the commission:

Book values of the elements going into making up the total valuation of the plant and property operated by the electric division of the company other than used for municipal street lighting. Book values of the municipal street-lighting plants. Operating income and expenses of the electric division. Data in respect to production and distribution of

electricity. Book values giving the valuation of the separate items in the gas divisions of the company. Operating income and expense of the gas division. Data in respect to manufacture and distribution of gas.

It was suggested that the inquiry be directed to cover the entire electric and gas system separately.

New Jersey Commission News.

The Board of Public Utility Commissioners, having been advised of several instances where contracts with public-utility corporations have been terminated on the allegation that the terms of the contracts constituted discriminations, has notified each public utility in the State to report to it all changes made in rates to customers receiving service at other than the regular schedule of rates, and also to report whenever any contract with a customer at a special rate is terminated and the charge to the customer is changed to the regular schedule of rates. The board has approved the proposed issue by the Middlesex Electric Light & Power Company of 5 per cent bonds to the amount of $5,000.

Wisconsin Commission News.

In a decision recently announced by the Wisconsin Railroad Commission the Beloit Water, Gas & Electric Company has been ordered to put into immediate effect a revised and reduced schedule of rates for electric lighting and motors. The former net rates for electric lighting varied from 15 cents net per kw-hour for the first twenty-five hours' use per month to 6 cents for all over 75 kw-hours per month, with a minimum bill, including meter rental, of $1.10 per month. The table of unit costs for electric service as determined by the commission is as follows:

Hours Daily Operation.	Capacity Cost in Cents.	Output Cost in Cents.	Total in Cents.
½	17.88	1.7	19.58
1	8.94	1.7	10.64
2	4.47	1.7	6.17
5	1.79	1.7	3.49
10	.89	1.7	2.59

The schedule of rates for electric lighting, based upon the above table, is as follows: For residence and business lighting Classes A, B and C, a primary rate of 12 cents net per kw-hour for energy used equivalent to or less than the first thirty hours' use per month of the active connected load; a secondary rate of 7 cents net for additional energy used equivalent to or less than the next sixty hours' use per month of the active connected load, and an excess rate of 4 cents net for all energy used in excess of ninety hours per month. In Class A, consisting of residences, etc., where the total connected load is equal to or less than 500 watts, 60 per cent of such total connected load is to be considered active. Where the installation exceeds 500 watts, 33⅓ per cent of such part of the total connected load over and above 500 watts is to be considered active. In Class B, consisting of business houses, offices, stores, theaters, depots, etc., where the total connected load is equal to or less than 2½ kw nominal rated capacity, 70 per cent of such total connected load is to be considered active. Where the installation exceeds 2½ kw capacity 55 per cent of such part over and above the 2½ kw is to be considered active, provided that lamps used exclusively in space devoted to the storing of goods are placed at 20 per cent active and not included in the 2½ kw specified above. In Class C, consisting of federal and county buildings, churches, hotels, factories, warehouses, etc., where the total connected load is equal to or less than 3 kw, 55 per cent of such total connected load is to be considered active. Where the installation exceeds 3 kw 40 per cent of the excess is to be considered active. In the case of Beloit College 30 per cent of the total connected load is to be active. For all signs and window lighting, on a yearly contract basis, a charge of 5 cents net per active 50-watt equivalent per month, plus 5 cents net per kw-hour consumed, is to be made. The load is to be considered as 100 per cent active. The minimum bill is fixed at $1 net per month.

The schedule of motor rates ordered by the commission is as follows: A maximum charge of 25 cents net per active horse-power capacity per month plus 4 cents net or 5 cents gross per kw-hour. The following percentages of the total rated capacity are to be considered active: Installations under 10 hp and only one motor, 90 per cent; under 10 hp and more than one motor, 80 per cent; between 10 hp and 20 hp, irrespective of number of motors, 70 per cent; between 20 hp and 50 hp, yearly contract basis, 60 per cent; between 50 hp and 100 hp, 55 per cent; over 100 hp, 50 per cent, and on less than a yearly contract basis, 70 per cent. Minimum bill, $1.25 net per month.

The company owns and operates two plants, one a steam plant and the other a combined steam and hydraulic plant. The tentative appraisal of January, 1909, gave the total physical valuation of the company as $811,820, of which $364,882 was apportioned to the electric plants. The company's alleged valuation, of June 30, 1910, was $1,896,000. This figure included among other things an item of $350,000 classed as promotion service expense. Relative to this the commission says: "The facts in regard to the financing of the present organization, value of tangible and intangible property, etc., make it appear that the costs shown by the books of the company do not meet the situation and cannot be regarded as of the greatest importance in these proceedings." Each department of the company is to be permitted to earn a fair rate of return upon the proportion of the physical valuation devoted to that particular branch of the service. A total of $40,000 was allowed for working capital. The company claimed an allowance of $150,000 for the value of the water-power controlled and used by it. The city insisted that $50,000 was the maximum that should be allowed. Several methods of determining the value of the water-power were discussed and analyzed in the opinion. It is pointed out that from a point of view of public policy it is questionable whether the allowance should exceed the cost of development and value of the physical property utilized. The investigation has shown that the development of the company's business is comparatively poor. This was shown to be due largely to the design of the rate schedules previously in force. Large users have been encouraged by rates which were so close to, if not below, the actual cost of production as to make it necessary to burden the smaller consumers with high rates in order to secure a reasonable return upon the investment as a whole. This policy has in turn tended to discourage the small user and has prevented a reasonably good saturation of territory and that development of the business which would justify the investment made and reduce the unit cost and thereby the rates for service. The company apparently had overlooked the fact, so strikingly brought out in other cities, that the business of the small-residence consumer if properly managed and developed through the granting of reasonable rates is one which will pay a large return upon the investment and should be the most profitable end of the business. An analysis of the consumer data reveals the fact that Beloit has a comparatively high average installation per consumer, but that the saturation of territory is poor and the small-consumer field poorly developed. Beloit has six lighting consumers per 100 of population. The average in the State is 8.43, with a minimum of 3.57 and a maximum of 14.35 (Madison). From past experience and from a careful study of conditions in Beloit the commission is con-

fident that the reduction in lighting rates will result in a very material increase in the residence-lighting business, which, with the low unit output cost, will enable the company to enjoy a greater rate of return than existed previous to the order, and to such an extent that a further rate reduction can be made and still permit the company to earn a fair and reasonable rate of return.

Canadian Hydroelectric Commission News.

At a meeting of the Village Council of Mimico, Ont., the offer of the Hydroelectric Commission to furnish electric energy was rejected on the ground that the municipality was not large enough to undertake the project at present. The commission's representative in making the offer stated that it would cost the village from $2,000 to $3,000 per year for thirty years to maintain a plant, this amount including interest on $7,500, which was the estimated cost of installing the civic plant.

CURRENT NEWS AND NOTES.

N. E. L. A. MEMBERSHIP.—The National Electric Light Association this week reached a total of 9300 members of various classes. The Michigan Electrical Association has voted for affiliation as a geographic N. E. L. A. section.

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N. E. L. A. COMMITTEE ON ORGANIZATION OF THE INDUSTRY.—Following the suggestion of the chairman, Mr. H. H. Scott, the name of the membership committee of the N. E. L. A. has been changed to the committee on organization of the industry.

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WATER WIRELESS.—Habibur Rahman Khan, deputy superintendent of telegraphs, Allahabad, India, in a pamphlet recently issued describes experiments on the use of streams of water as a substitute for the wire conductor of the ordinary telegraph system. With an ordinary Cardew vibrator and six dry cells communication was maintained by means of a river over a distance of 25 miles.

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OFFICERS OF THE NEBRASKA ELECTRICAL ASSOCIATION.—At the recent annual meeting of the Nebraska Electrical Association, which is affiliated with the National Electric Light Association, the following officers were duly elected for the coming year: President, Mr. H. A. Holdrege, Omaha; vice-president, Mr. F. H. Brooks, Lincoln; secretary-treasurer, Mr. S. J. Bell, David City. These officers have now entered on their duties.

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EXAMINATION FOR ELECTRICAL ENGINEER AND DRAFTSMAN.—The United States Civil Service Commission will hold an examination on Aug. 23-25 to secure eligibles for the position of electrical engineer and draftsman at $1,200 per annum in the office of the supervising architect of the Treasury Department at Washington. Full information is given in Circular No. 629, a copy of which may be obtained upon application to the commission at Washington, D. C.

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IMPORTATION OF ELECTRICAL ENERGY FROM CANADA.—Among the matters which have been referred to the public policy committee of the N. E. L. A. is a suggestion that action be taken to induce the United States to prohibit the importation of electrical energy from Windsor, Ont., to Detroit, Mich. The Ontario Hydroelectric Commission is reported to be unwilling to build a transmission line to Windsor unless permitted to supply energy also to Detroit. The project is meeting with opposition from certain local central-station companies in Canada, which would be involved in financial and political difficulties if the line were built through their territories.

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TUNNEL UNDER ST. LAWRENCE RIVER.—It is proposed to construct a tunnel under the St. Lawrence River between Montreal and the South Shore, and it is stated that for this purpose some land and options on other tracts have been obtained by the Montreal Street Railway Company. It is also stated that the Canadian Northern Railroad and the Delaware & Hudson Railroad are interested in the project. A route map has been filed at Ottawa.

* * *

NEW OFFICERS OF ST. LOUIS N. E. L. A. SECTION.—The Union Electric Light & Power Company Section (St. Louis) of the National Electric Light Association has elected new officers. Mr. Burt Crouch, assistant sales manager, was chosen president; Mr. D. A. Scullin, of the meter department, treasurer, and Mr. H. G. Kislingbury, company statistician, secretary. Messrs. E. H. Tenney and Orrin Hull were elected vice-presidents. The next regular meeting of the section will be held in the fall, but an outing of some kind is promised for August, probably taking the form of a boat ride on the Mississippi River, under the auspices of the section.

* * *

FREQUENCY IN ELECTRIC RAILWAY WORK.—At the July meeting of the executive committee of the N. E. L. A. communications relative to the two frequencies now employed in the transmission of energy for railway service were read from Mr. B. F. Wood, of the Pennsylvania Railroad, and Mr. Henry L. Doherty, of New York. Mr. Doherty stated that the association should endeavor to establish the electrification of main lines of railroads in directions that would be of value to the central stations of the country. He expressed the opinion that it would be best and preferable to use 60-cycle current for railway work. The matter was referred to the committee on apparatus.

* * *

HAMILTON, ONT., TO BUILD MUNICIPAL PLANT.—The election held in Hamilton, Ont., on July 25 to vote on a by-law to issue debenture bonds for $500,000 for a municipal light and power plant resulted in a majority vote of 418 in favor of the project. Hamilton was the last of the large cities in the Province of Ontario to resist municipal ownership and the aggressive Hydroelectric Power Commission of the Province of Ontario. The Dominion Power & Transmission Company, which controls the railway and lighting properties in Hamilton and vicinity, fought the measure by a publicity campaign in which it was encouraged by the support of the leading daily papers; and although it succeeded previously in keeping the local government from contracting with the Hydroelectric Commission for full service on the strength of the excellence and cheapness of its own, it could not stem the tide for municipal ownership which had already engulfed Toronto, London, Ottawa, Winnipeg and other large cities of the Dominion. The company has a very efficient hydroelectric development at De Cew Falls on the Welland Canal which it is at present enlarging, together with steam auxiliary stations at Hamilton and Brantford and hydroelectric auxiliaries at Brantford and St. Catharines. The head at De Cew Falls is 269 ft. and the cost of generating energy at that place is said to be as low as, if not lower than, that at any other plant in America, so that competition should be keen. Engineer Sifton, who prepared the estimate for the municipal plant, will immediately draw up the specifications. According to the provisions of the by-law presented to the taxpayers the sum of $29,213.45 must be raised annually by special rate on all the taxable property in the municipality to pay interest on the bonds and to create a sinking fund to retire them at the end of thirty years.

Electric Pumping for Parks.—The City Council of Chicago has granted the South Park Commissioners of that city authority to install two electrically driven pumps, each having a rating of 2,500,000 gal. in twenty-four hours, at the shaft leading to the city water tunnel at Sixty-eighth Street and Yates Avenue. The park commissioners may by this means pump water for park purposes at their own expense, as they are to pay for the equipment and the electrical energy, the latter being supplied from the Chicago Drainage Canal.

* * *

Convention of Colorado Electric Light, Power and Railway Association.—The next meeting of the Colorado Electric Light, Power and Railway Association will be held at the Hotel Colorado, Glenwood Springs, Col., Sept. 13 to 15 inclusive. The program includes the following papers: *Lamp Efficiency,* by Mr. S. E. Doane, Cleveland, Ohio; *Welding by the Oxyacetylene Process,* by Mr. K. L. Brackett, Denver, Col.; *Electricity for Advertising Purposes,* by Mr. G. E. Williams, Denver, Col., and *The Sale of Electric Power for Mining Purposes,* by Mr. Franklin P. Wood, Cripple Creek, Col. Mr. F. D. Morris, Colorado Springs Light, Heat & Power Company, Colorado Springs, is secretary.

* * *

A 1-Cent Telephone Call Suggestion.—Alderman Herman J. Bauler, of the Twenty-second Ward, Chicago, has attracted some attention by proposing that the Chicago Telephone Company be required to give prepaid telephone calls at 1 cent each, the present rate being 5 cents. The alderman suggests that there be an annual service charge ranging from $10 a year for two-party residence lines to $35 a year for business service. In addition a charge of 1 cent would be made for each outgoing call. Although Alderman Bauler is a member of the City Council committee on gas, oil and electric light, which has in charge the revision of telephone rates, it is not believed that the committee will indorse the suggestion.

* * *

Maine Electric Association.—The third annual meeting of the Maine Electric Association was held at Augusta, Maine, Thursday and Friday, July 27 and 28, with headquarters at the Augusta House. On Thursday morning there was a meeting of the executive committee and for the registration of members and guests. The afternoon session was devoted to the reading and discussion of papers, followed by a business meeting and election of officers. In the evening special cars were provided for a trip to Island Park, where a supper was served. Friday was given over to a trip on a special boat down the Kennebec River to one of the islands for a clambake. Mr. W. S. Wyman, Waterville, Maine, is secretary.

* * *

Corraling Eels with Electric Light.—The Danish government, under the direction of its biological department at Copenhagen, has undertaken to aid the fishermen of the Baltic Ocean by preventing the migration of eels from that arm of the sea into the outer ocean. The means employed is a barrier of light, formed by placing fifty electric lamps along a submerged cable between the island of Fano and the coast of Funen. The eels migrate only during the dark hours, and, accordingly, as soon as darkness begins in the season of migration the lamps are illuminated and a wall of light is thus interposed which the eels are fearing of passing. A similar plan, using submerged lamps, is said to be a favorite resort of Italian fishermen to keep eels from leaving the shallow waters.

* * *

Wireless Studies in the Tropics.—A Marconi telegraph operator who was sent to the Congo especially for the purpose of studying conditions relating to wireless telegraphy in the tropics reports that certain atmospheric conditions at night and the apparent effects of the sun's rays at certain times by day make long-distance communication impossible in that region of the tropics. There are times, however, notably at about 5 a. m. or 6 a. m., when these disturbances are at a minimum and long-distance messages can be received without difficulty. Stations at Boma and Banana are now in operation and have succeeded in establishing communication with each other, a distance of 55 miles, and with vessels at a considerable distance at sea. Stations at Leopoldville and St. Paul de Loanda are expected to be in operation shortly. Two companies are represented in the Congo, the Telefunken, of Berlin, and Radio-Télégraphie, of Paris.

* * *

McCall's Ferry Power at Baltimore.—The United Railways & Electric Company of Baltimore is now operating its cars by power from the Pennsylvania Water & Power Company, which is brought from McCall's Ferry. Under the contract between the United Railways and the Pennsylvania Water & Power Company, which was entered into last February, both corporations have since been engaged in installing necessary cables, switching apparatus and other instruments for the transmission and reception of the hydroelectric energy. According to President House, this work was not expected to be completed until next September. It is not proposed to discontinue entirely operations at the Pratt Street power station, but to utilize the river power in conjunction with that generated at Pratt Street. The power is transmitted from the Orangeville substation to the Pratt Street power station, where it is distributed to the substations of the United Railways. At these stations it is "stepped down" from 13,000 volts and transformed into direct current.

* * *

Installation of Lightning Conductors.—Rules for the installation of lightning rods issued by the Phœnix Fire Office, England, deal with methods of protection, material of conductors, earth connections and special risks. It is pointed out that the only way to secure absolute protection against the disruptive form of lightning discharge is to inclose the building in a metal framework, constituting what is termed the "bird-cage" system of conductors. Under proper supervision this can be accomplished generally by utilizing the rain pipes and gutters as part of the system. "The ordinary conductors must be used in addition, and the whole system should be effectively connected to earth in a number of places. The material of the conductor should be of copper tape, measuring at least 1 in. x ⅛ in., or, if copper cable be adopted, it should not consist of less than seven strands, each ⅛ in. in diameter. Soft iron may be used in place of copper, and except for chemical reasons and for permanence the sectional area need not be greater than in the case of copper. Conductors should be kept a certain distance away from walls so as to prevent the accumulation of dirt, but they must not be insulated. If a copper plate is used for each earth connection it should be not less than 3 sq. ft. in area and ⅛ in. in thickness, and should be adopted only where it will always be in water or moist earth, otherwise connection should be made to the water mains or the "tubular" system should be employed. The number of connections depends on the ground area of the building, but there are few structures where less than two are necessary. The elevation rod of factory chimneys should be a circular band placed round the top of the shaft, with points fixed at an angle of 45 deg. and extending outward, or an arch of metal provided with points may be fixed across the mouth of the chimney." To these rules may be added the remark that an excellent ground may be made by placing the copper plate at the bottom of a well about 6 ft. deep filled with stone and cemented over near the surface, to which a house rain leader is connected. During a thunderstorm the water carried to the well will make a wet ground.

HYDROELECTRIC TRANSMISSION SYSTEM FOR QUARRY AND MILL WORK.

Generating Stations and Substations of the Vermont Marble Company.

BY C. T. MAYNARD.

IN the spring of 1910 the Vermont Marble Company acquired the water rights on Otter Creek at Huntington Falls, 4 miles north of Middlebury, where there is a drop of 40 ft. and a flow which it is estimated will give in extreme dry periods from 1000 hp to 1200 hp.

Immediately upon acquiring these rights the engineers of the Vermont Marble Company began plans for a hydroelectric development to operate in parallel with the older transmission system and for the construction of substations along the new transmission line.

In order more fully to understand the existing conditions a brief description of the older system will be given. At Proctor three 1200-hp turbines, direct-connected to three 750-kw generators, work under a head of 120 ft. This plant is about 30 miles south of the Huntington Falls station and on the same stream. The power is generated at 480 volts and from 750 kw to 1000 kw is used at this voltage in the Proctor mills and shops. The balance is stepped up to 10,000 volts by three 500-kw water-cooled transformers and delivered to West Rutland and Albertson, where the company operates extensive mills and quarries. The Albertson substation is of 300-kw rating and the West Rutland substation of 900-kw rating. At West Rutland, on the 3300-volt side of one of the banks of transformers, there is a 500-kw steam plant which, since its installation three years ago, has run in parallel with the Proctor station during the low-water periods. At Proctor, West Rutland and Albertson motor-generator sets are installed for supplying direct current for numerous cranes, hoists and some quarry machinery. The standard shop and mill alternating-current voltage is 440, and for direct-current and alternating-current quarry work 220 volts has been adopted. However, at West Rutland three 3120-volt synchronous motors aggregating 550 hp are used for mill work. The quarries were formerly operated by steam hoists, channelers, drills and pumps from isolated boilers. The great inefficiency of these isolated steam plants and the success of electricity for quarry work, as demonstrated at West Rutland during the past few years, convinced the marble company of the advisability of connecting its large chain of quarries and shops to an electric system. The new transmission line passes north and south along the

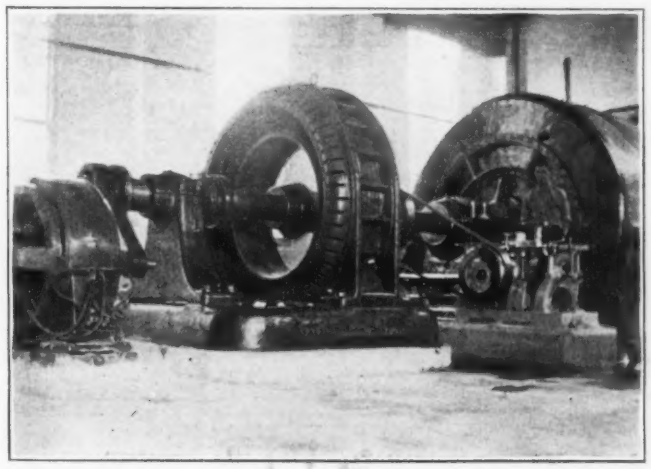


Fig. 1—Generating Unit at Huntington Falls Power Station.

marble vein, consequently energy can be taken at any point on the line for any new quarry without running the line any great distance. There are at present on the system three generating stations, one tying-in station and four substations. Two more substations are to be built this summer. There is a connected load of 7000 hp, made up by 250 motors. Of this 2000 hp is in direct-current apparatus of the shunt and series type. Squirrel-cage-type in-

Fig. 2—Huntington Falls.

duction motors are used for shop and mill operation and the rotor-resistance type for hoist and quarry work.

TRANSMISSION SYSTEM.

The line starts at Huntington Falls and goes in a southerly direction east of Middlebury, through Brandon and Fowler to West Rutland, where it terminates in a tying-in station a few feet away from the West Rutland substation. The line is 34 miles long and passes for the most part through farm and pasture land, although 5 miles of it traverses in a diagonal direction a rough mountainous country.

The conductor is No. 3 bare medium hard-drawn copper supported on 50,000-volt slate glaze Thomas insulators. Cedar poles ranging from 35 ft. to 45 ft. in length with 7-in. to 9-in. tops are used. The conductors are spaced on a triangle 4 ft. 6 in. on the sides and 5 ft. on the bottom. The cross-arms are of unbled hard pine 5 ft. 10 in. x 4¾ in. x 6¾ in. All gains and tops are painted with

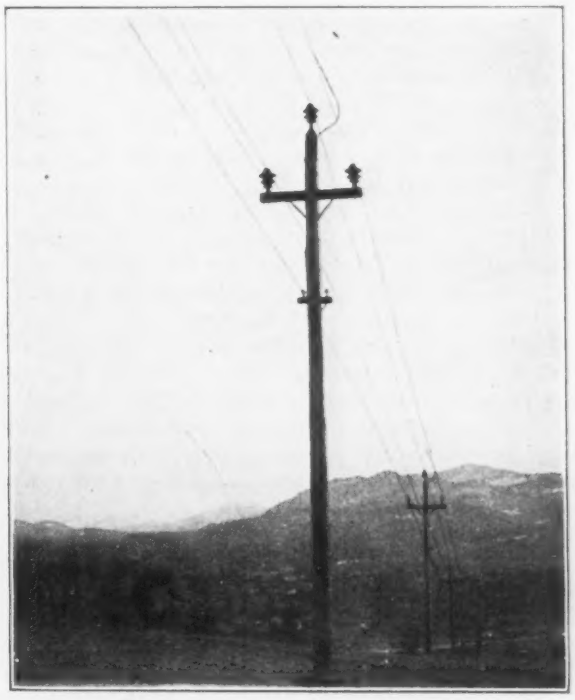


Fig. 3—Transmission Line with Telephone Crossing Protection.

Avenarius carbolineum. The top pins are of galvanized-iron pipe and the cross-arm pins are of the Lee type, consisting of a cast-iron cone 20½ in. x ¾ in., a rod threaded both ends, and a thimble which is screwed on the rod.

The thimbles were all cemented in the insulators at the factory. The cross-arm braces are 30 in. x 1½ in. x ¼ in. and are not toe-lagged in the pole, as is usually done (experience showing that this work is never well done by linemen), but are toe-bolted to the pole. The line crosses the

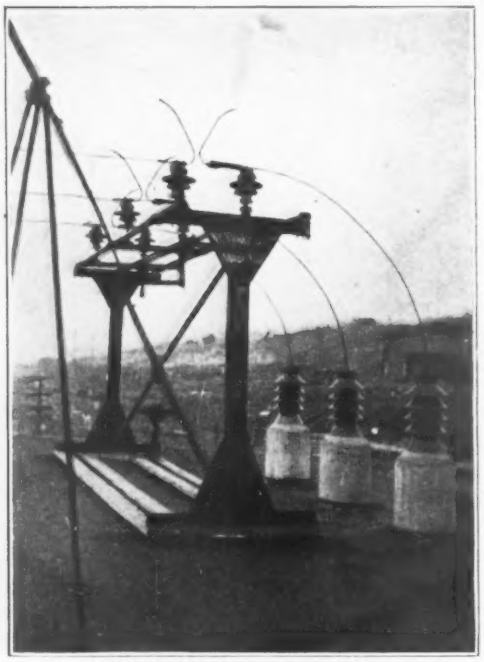


Fig. 4—Standard Horn-Gap Support and Roof Entrances at West Rutland.

Rutland Railroad at Brandon and Beldens and steel towers are to be erected at these crossings. There are five transposition poles, giving the line two complete twists.

Seven feet below the lower wires a telephone line is carried on two-pin cross-arms, and this line is transposed every third pole. Two poles each side of all telephone and telegraph crossings the pins are grounded; ground wires are fastened across the large arm and up each side of the pole above the arm. A galvanized-pipe lightning rod extends 3 ft. above the top transmission wire. Each insulator on these crossing poles has a cast-iron cap and an extra serving of wire 2 ft. each way from the center of the insulator. Over the more dangerous crossings and one span each side No. 1/0 stranded copper cable is used for the transmission wires. The standard pole spacing is 150 ft., but many spans are less. There are no curves in the line, but where a turn is necessary it is made in most cases on a double-pole construction with two arms and two sets of insulators. Less abrupt turns are made on two standard poles about 15 ft. apart. Dead ends are made with three 12-in. strain insulators in series. Just north of the Brandon substation line switches have been installed. These switches are about midway between Huntington Falls and West Rutland and are used for making the north end of the line dead if necessary or to assist in locating trouble. The work of cutting out a path for the line began last July and the line was completed late in December.

GENERATING STATION AND SUBSTATIONS.

The Huntington Falls station is built on concrete foundations resting on bedrock and has a brick superstructure. The high-tension compartment is 11 ft. 6 in. x 42 ft. and two stories high. In the transformer-room space for six transformers is left on a raised pier next to the generator-room. The space in front of the transformer pier is for a car so that any transformer can be run out on this car to one end, where an opening in the floor above and an I-beam 30 ft. above the first floor enable transformers to be handled readily. Three 500-kw water-cooled transformers stepping up the voltage from 2300 to 44,000 make up the present installation. The second floor of the high-tension compartment contains the aluminum-cell lightning arresters, the 44,000-volt oil switch, disconnecting switches, choke coils, outgoing line and operating stand for the arrester horn-gaps, which are on the roof.

The generator-room contains two 1200-hp S. Morgan-Smith turbines direct-connected to two 750-kw, 2300-volt, 60-cycle, 300-r.p.m. generators; two improved governors, the main switchboard and two 30-kw, 125-volt exciters, chain-driven from the generator shafts. Provisions are made so that by increasing the head to 65 ft. and changing the turbine runners and guides the turbines will deliver 2400 hp each. In this case one 750-kw generator would be placed in tandem with the other and a 1500-kw generator direct-connected to the other turbine, giving a plant rating of 3000 kw. A 10-ton traveling crane is installed above the generator-room floor.

The main switchboard contains six panels of selected marble carefully matched. There is one panel for each of the exciters and generators, one regulator panel and one station panel. One other panel, mounted on the wall back of the main switchboard, contains the 2300-volt disconnecting switches for making each unit dead back to the 2300-volt busbars. Two 10-ft. penstocks embedded in the concrete forebay dam, each about 30 ft. long, rise sharply from the ends of the turbine casings to the forebay. The main dam is of crib fill and is the same that was used by the pulp mill which formerly occupied the site.

SUBSTATIONS.

At Brandon, where the company operates a mill and quarries, the energy is stepped down to 2300 volts. The present installation consists of two 150-kw oil-cooled transformers with space for four more. The mill, close by, is driven by a 100-hp, 2200-volt induction motor. Energy at 2300 volts is also transmitted to the quarries, where it is transformed to 230 volts.

The substation is 29 ft. x 16 ft. 6 in. inside and has a second floor at the back end 17 ft. x 11 ft. 6 in. The main incoming and outgoing oil and disconnecting switches and transformers are installed on the first floor. The lightning-arrester tanks are installed in the second story, with the horn-gaps and operating stand on the low roof. This substation, like the others, is constructed of marble blocks with concrete floors.

The Hollister substation is a duplicate of the one at Brandon and contains one 100-kw, three-phase and one 250-kw, three-phase oil-cooled transformer, operating in

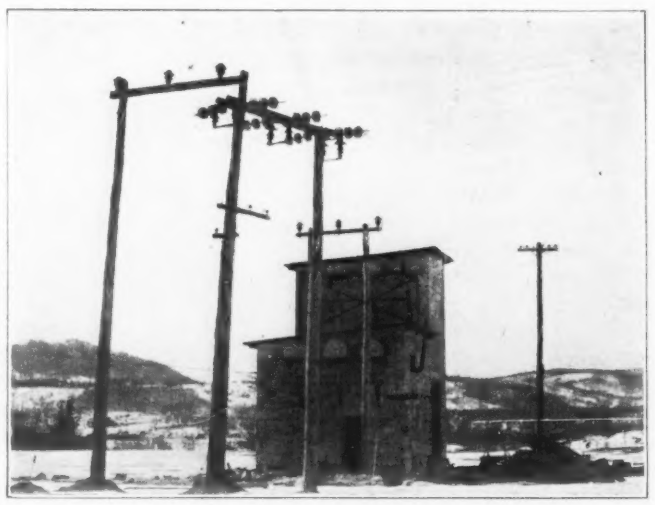


Fig. 5—Brandon Substation and 44,000-Volt Line Disconnecting Switch.

parallel and stepping down to 230 volts. The 230-volt energy is used by quarries very near the station, the bulk of it being used in another station 100 ft. away, where there are two 165-hp and one 112-hp hoist motor, two 125-hp compressor motors and one 100-hp motor driving a 75-kw

direct-current generator. The energy used in the quarry is for drills, channelers and pumps.

A mile south of the Hollister substation another substation is to be built to accommodate five 300-kw transformers for operating the Rutland-Florence mills and quarries recently acquired by the Vermont Marble Company.

The largest and most important transformer station is located at West Rutland. This station is 43 ft. 6 in. x 26 ft. and two stories high. The present rating is 1500 kw in three water-cooled units of 500 kw stepping down from 44,000 volts to 10,000 volts. Space is provided for three more units. Each floor has one room 31 ft. x 24 ft. and another 10 ft. x 24 ft. The larger room downstairs is for the six transformers and the smaller is used as a storeroom. The large room upstairs contains the 44,000-volt switches, incoming line and lightning-arrester tanks. The smaller room on this floor contains the 10,000-volt switches for paralleling the old and new systems, also the station panel. This panel has a wattmeter, which indicates in what direction the energy is being sent, a voltmeter, a synchronizing meter and the operating handle of the 10,000-volt phasing oil switch. From this room two selecting 10,000-volt lines go out, so that the new system can be run in parallel with Proctor, West Rutland or both, the latter being ordinarily done.

The transformer-room is designed to facilitate handling of the transformers. A pit 18 in. deep is built between the two banks of transformers and in this pit a car travels the length of the room. The transformers being mounted on wheels, trucks may be run out on rails built on this car and the car then run out to one end. At this end there is a 6-ft. open space the full width of the station. In the second floor, 24 ft. above the first floor and extending directly over the center of this opening, there is a trolley traveling the full width of the station, enabling a transformer to be lifted from the car or taken apart.

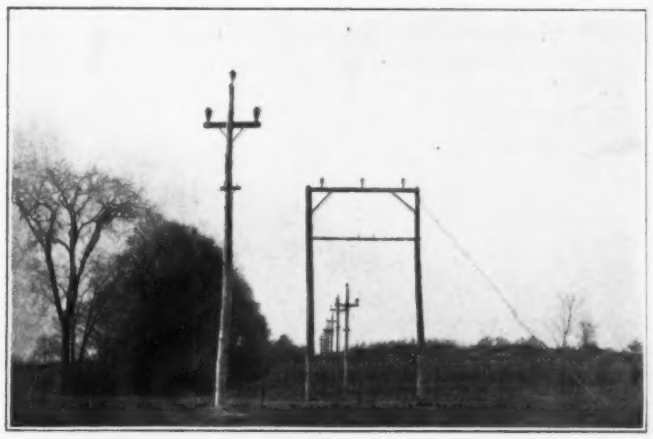


Fig. 6—View of Transmission Line Showing Standard Corner Construction.

The incoming 44,000-volt line enters through wall bushings protected on the outside by galvanized-sheet-iron hoods. Taps from the main line, outside the station, pass to the lightning-arrester horn-gaps on the station roof and from the horn-gaps the line enters through roof entrances to the arrester tanks in the room below. The 44,000-volt conductors are all of copper tubing.

Electricity was first turned on the new line at full voltage on March 12 from the Proctor station, stepping up from 10,000 volts to 44,000 volts at West Rutland, and soon after load was put on at both Brandon and Hollister substations. The Huntington Falls station was first phased in on May 17.

The system was designed, constructed and put into operation by the Vermont Marble Company. The electrical equipment was furnished by the General Electric Company.

SINGLE-PHASE LOCOMOTIVE EQUIPMENT FOR THE LOETSCHBERG LINE IN SWITZERLAND.

By M. P. Misslin.

THE general electrification of main-line railways in Switzerland has been hastened by the decision of the Compagnie du Chemin de Fer des Alpes Bernoises, Berne-Loetschberg-Simplon, to adopt electric traction for operating the whole line, 40 miles in length, with single-phase current at 15,000 volts and 15 cycles, which corresponds to the system employed on the Seebach-Wettingen line of the Swiss Federal Railways. This decision was the result of exhaustive studies carried out by Mr. L. Thormann, consulting engineer at Berne, who was also intrusted with the supervision of the work in connection with the electrification.

The line starts at Spiez on the lake of Thoune and at Brigue joins the existing Simplon route, leading to Milan, thus forming a direct connection between the eastern parts of France and Italy—that is, between Paris and Milan. As it will have to deal mostly with through traffic and passes through a very mountainous district, it encounters in many points conditions similar to those of the St. Gothard route, and the experiences gained on the Loetschberg line will therefore prove of great benefit at the time of electrifying the St. Gothard route.

Only a portion of the whole line, leading from Spiez to Frutigen, of a total length of 13.5 km (8.5 miles), is at present opened to traffic; the remainder will follow in from one to two years' time after completion of the Loetschberg tunnel. The section from Spiez to Frutigen, formerly operated by steam locomotives, has been electrified and serves for the present as an experimental line.

The maximum gradient of this section is 1.5 per cent and the average gradient 1.117 per cent, whereas the continuation of the line will have a maximum gradient of 2.7 per cent. About 40 per cent of the total length of the experimental line is in curves, of which the smallest has a radius of 1000 ft.

The track on the open line consists of rails each 12 m (39 ft.) long, weighing 75 lb. per yard, and laid on oak sleepers; in the tunnels a new system of fixing the rails, such as is employed on the Austrian State Railways, will be used. The section from Spiez to Frutigen comprises about 14 miles of track, all fitted with overhead construction of the catenary suspension type.

The first equipment designed to deal with the traffic on the experimental line consists of two locomotives and three motor cars. The latter and a 2000-hp locomotive were ordered from the "Elektrische Bahnen," Zurich (the joint office for the electric traction on standard-gage lines in Switzerland of the Maschinenfabrik Oerlikon and the Siemens-Schuckert Works), whereas a 1600-hp locomotive was supplied by the Allgemeine Elektricitäts Gesellschaft, of Berlin. After opening the whole line, the motor cars, which have been in service since the first of November, 1910, will deal with the suburban traffic between Spiez and Kanderstag, whereas the locomotives, which at present are engaged in hauling freight trains from Spiez to Frutigen, will haul trains up to Brigue.

The 1600-hp locomotive is fitted with two Winter-Eichberg motors, each driving through connecting rods two axles, combined with one pony axle fitted to one bogie truck. The normal output developed by this locomotive enables it to haul a 250-ton train at a speed of 25 miles per hour up gradients of 2.7 per cent.

In the following is given a short description of the 2000-hp locomotive, which was placed on the line first. The electrical equipment of this unit was designed and supplied by the Maschinenfabrik Oerlikon, whereas the framework and other non-electrical parts were supplied by the Swiss Locomotive Works, of Winterthour.

The specification required the locomotive to be able to

haul trains of 310-ton (weight of locomotive not included) at a speed of 27 miles per hour up gradients of 2.7 per cent, and, with the same speed, trains weighing 500 tons up gradients of 1.55 per cent. The starting acceleration at these loads required a drawbar pull of 22,000 lb. When

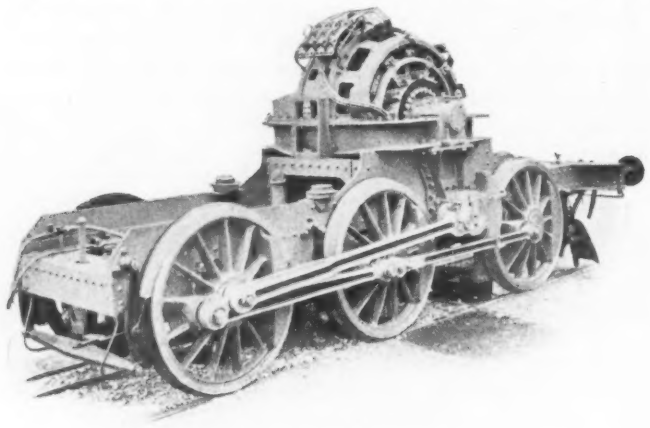


Fig. 1—Truck with Motor for Electric Locomotive.

starting on gradients a drawbar pull of 28,000 lb. was required. The maximum speed demanded was fixed at 43.5 miles per hour, while the maximum weight per axle allowed was 15 tons. It was further stipulated that the locomotive had to be arranged to take curves 590 ft. in radius. By a series of exhaustive trial runs it has been ascertained that the locomotive, as supplied, fully meets the conditions of the specification. Considering further the high working pressure and the wide range of speed regulation for which the locomotive has been designed, still adhering to normal axle pressures and adhesion weights, the locomotive constitutes the lightest electric locomotive yet built.

The following are the principal data of the locomotive, an illustration of which is given in Fig. 2.

Mechanical data, in mm:	
Gage (4 ft. 8.5 in.)	1,435
Length over buffers	15,020
Width of cab	2,950
Height to top of cab	3,740
Height of cab floor above rail	1,500
Distance between centers of bogies	5,200
Total wheel base	10,700
Wheel base of each bogie truck	4,050
Diameter of driving wheel	1,350
Width of rim of driving wheel	140
Electrical data:	
Line voltage	15,000
Number of motors	2
Frequency, cycles per second	15
Normal total rated hp	2,000
Normal speed, km per hour	42
Maximum speed, km per hour	70
Normal drawbar pull, kg	10,000
Maximum drawbar pull, kg	13,000
Gear ratio	1:3.25
Coefficient of adhesion at normal drawbar pull	1:6.8
Coefficient of adhesion at maximum drawbar pull	1:5.3
Weights in tons:	
Mechanical equipment, including brakes	46
Electrical equipment	44
Total	90
Weight available for adhesion	90
Maximum weight per driving axle	15
Weight of one bogie truck, without motor	18.5
Weight of one motor	9.8
Weight of one transformer	5.5

MECHANICAL EQUIPMENT.

The locomotive is composed of two six-wheel bogie trucks, each truck being fitted with one motor. Each motor drives through a single reduction gear a countershaft, which, by means of a crank pin and connecting rod, operates the coupled driving wheels, as shown in Fig. 1. The bogie frame is supported on the axles by large elliptic springs of great elasticity. The suspension gears of the two inner axles are connected together by means of spring-borne supports in order to distribute uniformly the total weight on the different springs.

All the coupling and pulling gear has been fixed to the truck framework, so that the cab itself is freed from any mechanical strain.

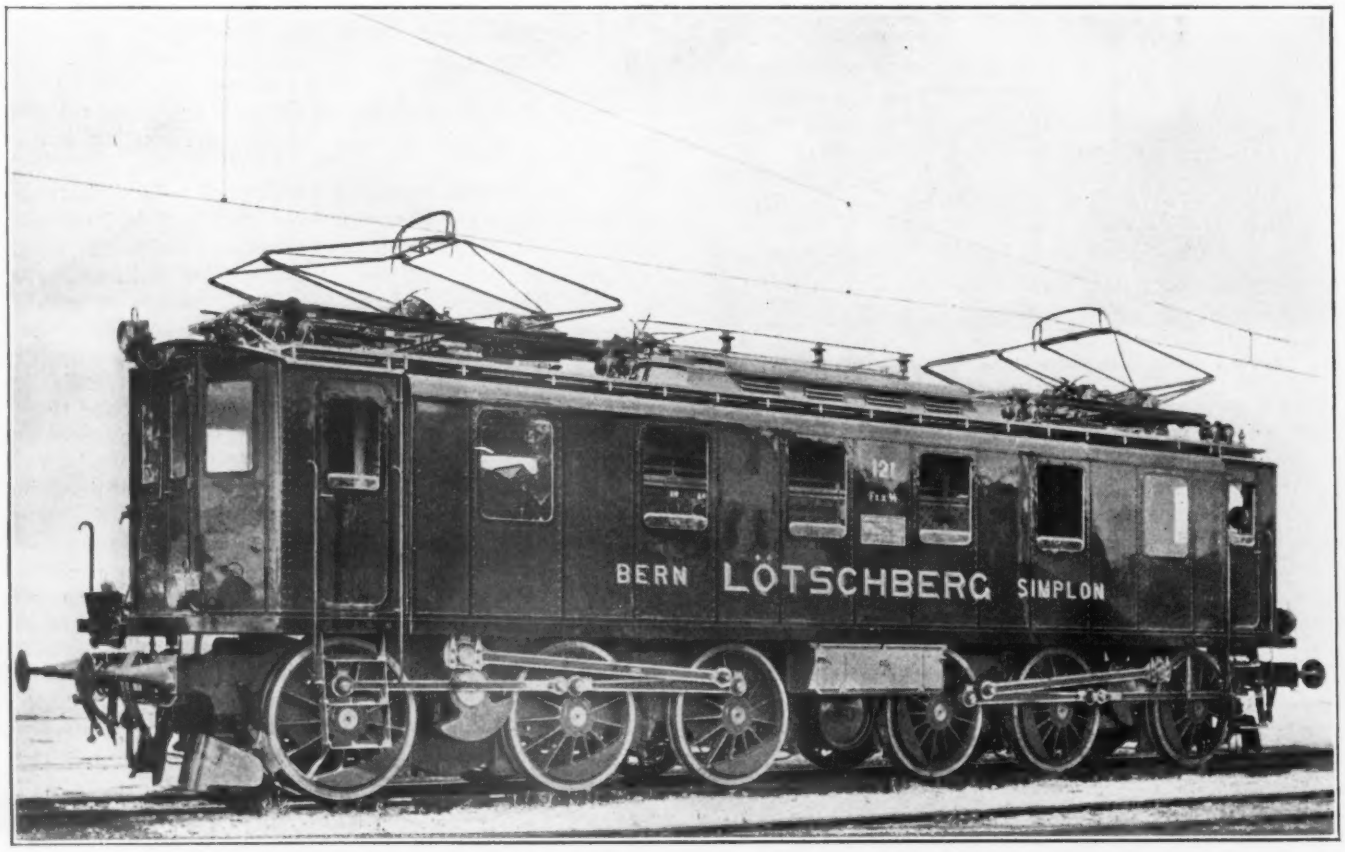


Fig. 2—2000-hp Electric Locomotive.

The two motors and their reduction gear, which latter forms an integral part of the motor, are rigidly fixed on the frame, above the two outer road wheels they have to drive, so that the shaft carrying the large spurwheel may well be considered the motor shaft.

The pinion of forged Siemens-Martin steel has been

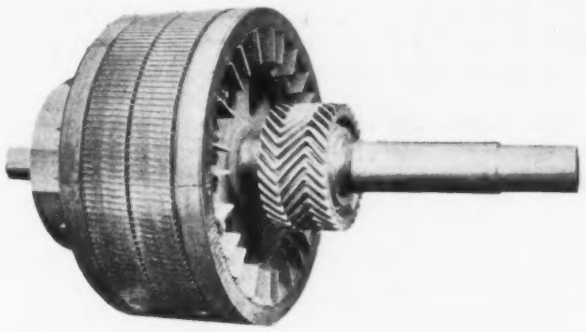


Fig. 3—Armature and Pinion Mounted on Shaft.

pressed on the shaft with a pressure of about 40 tons, and is placed between the armature and the bearing opposite the collector. The rim of the spurwheel consists of rolled Siemens-Martin steel, and is fixed to the cast-steel spider in such a way that it can easily be dismounted. The reduction gear has been supplied by A. Citroën & Co., of Paris. The wheels are 250 mm wide and have pitch circle diameters of 447 mm and 1453 mm, corresponding to a gear ratio of 1:3.25. The teeth are of wave-like shape, the wave being composed of three legs joined together at angles of 45 deg. and having rounded vertex, Fig. 3.

In spite of the high circumferential velocity (22 m per second as a maximum) and the great stress to which the material employed is subjected (maximum 260 kg per sq. cm), the running of the reduction gear is perfectly regular and silent, attributable to the special design and machining of the teeth and to the absolutely rigid method of supporting the shafts of the reduction gear.

The height of the motor shaft above rail is 1.80 m. The shaft carrying the spurwheel is fixed 265 mm above the proper driving axles and operates the three coupled running axles by means of cranks and connecting rods 2.7 m in length. The two crank pins on either side of each bogie truck are displaced against each other by 90 deg., and the rotating masses are perfectly balanced.

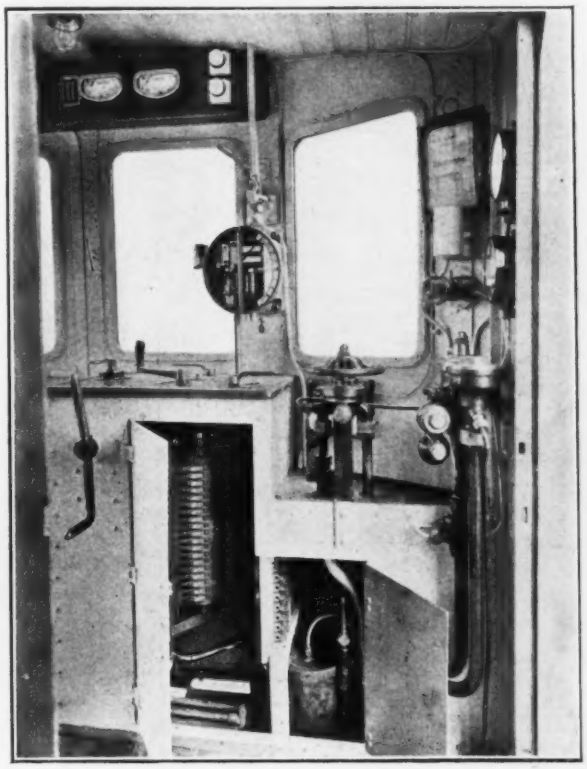
The cage of steel rests on each bogie on two seats, fixed to the outer frame. The bogie journals, which have ample sideways play, are guided by a strong longitudinal beam, forming at the same time the connecting link between the two bogie trucks. This beam carries also the heavy parts of the electrical equipment—the transformers and auxiliary apparatus—whereas the framework of the cage itself is kept as light as possible, without interfering with the mechanical strength of the structure.

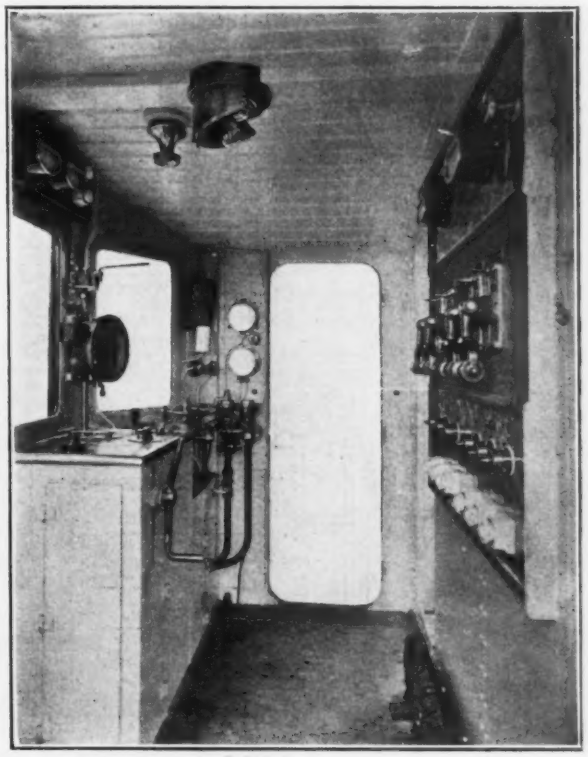
Two iron partitions divide the cage into three compartments—one at either end of the locomotive, for the driver, and one machine-room. A passage leading along one side of the machine-room connects the two driver compartments.

The floor consists of iron sheeting, covered with pitch-pine and linoleum, wherever possible. Around the motors suitable openings have been left in the floor covering. To enable easy inspection and access to the motors, the motors are left practically uncovered, even during travel. The compartment in which the high-tension switch gear and the transformers are placed is screened in by suitable iron guards, which can be opened only when the energy collectors have been taken off the line. The moment the guards are removed the high-tension line is automatically grounded; the trolley can be brought to contact with the overhead line again only when the above-mentioned guards are again shut.

Three large openings, closed by rainproof flap covers, are provided in the roof of the cage for permitting the removing of motors, transformers and auxiliary apparatus.

The machine room is provided with twelve large windows, of which eight can be opened. The ventilation of the machine room is effected by means of these windows and the shutters provided for in the monitor roof of the cage.





Figs. 4 and 5—Driver's Compartment.

Each of the two spacious driver compartments is accessible by two side doors and one front door, leading to a

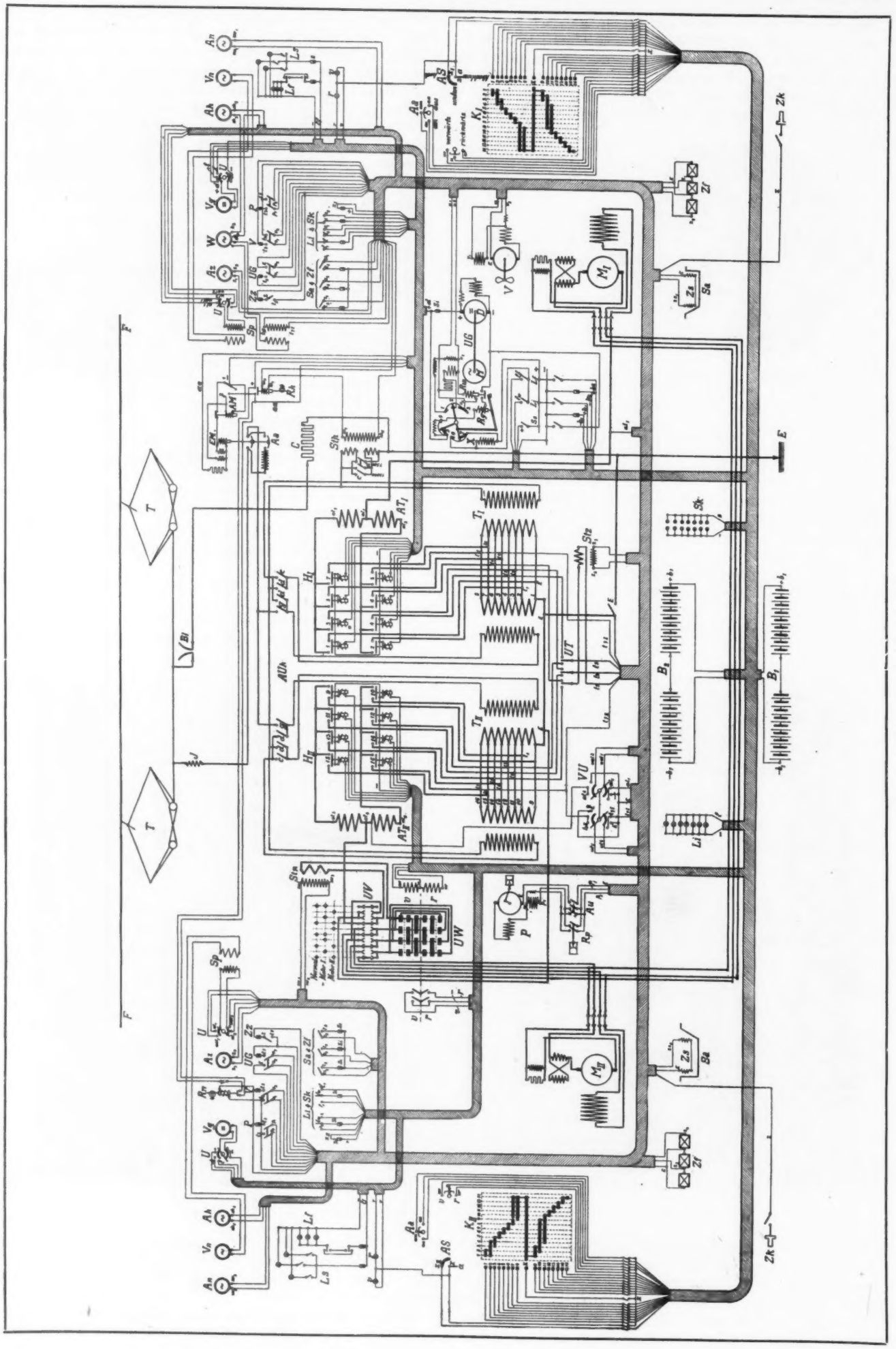


Fig. 6—Diagram of Connections.

platform, from which one can cross over to the car attached. The side doors are provided with shutters and footboards.

A folding ladder fitted on each platform provides access to the cage roof for inspection. These ladders are connected with an air valve in such a way that as soon as a ladder is put up the air contained in the pressure cylinders, operating the current collectors, discharges, whereby the current collectors are automatically taken off the line, even should this have been overlooked by the driver before ascending the roof.

The equipment of each of the two driver compartments is identical. As shown in Figs. 4 and 5, each is fitted with a control desk comprising the necessary gear for changing the running direction, for regulating the motor voltage, for operating the current collectors, the high-tension switches, the brakes, the sanders and the signal whistle. The controlling instruments, such as tachometer, voltmeter and ammeter, are fixed above in front of the control desk. In the rear of each driver's compartment is fixed a marble board, which contains the switches for the lighting and heating and the auxiliary machinery, and a number of measuring instruments.

Besides the ordinary hand brake each bogie is fitted with one automatic and one hand-operated Westinghouse brake. Each bogie truck carries one brake cylinder, and in operating the brakes only the brakes on the same bogie can be brought into action. Each bogie has six brakeshoes and one electrically heated sander with four distributing pipes.

The compressed air required for the manipulation of the current-collecting gear, of the whistles, of the brakes and the sanders is supplied by an electrically driven plunger

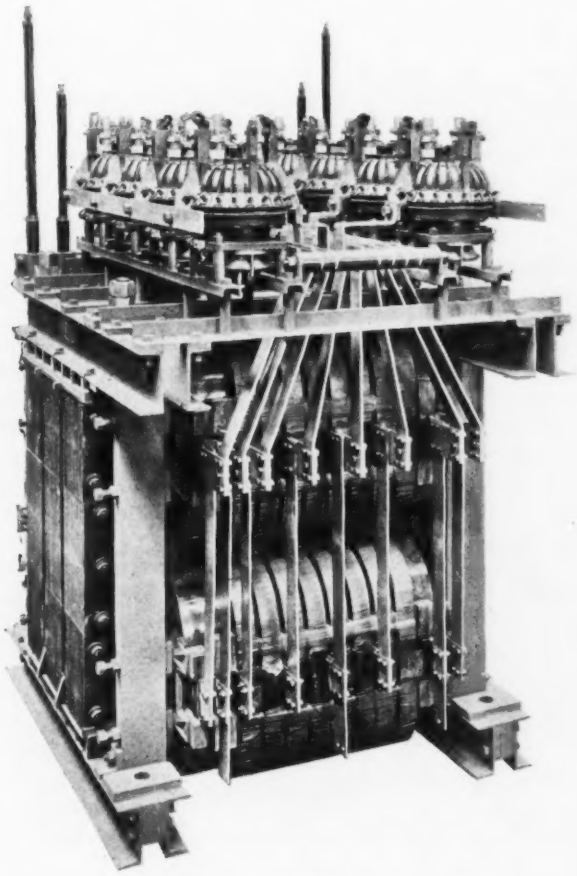


Fig. 7—Transformer and Step Switches.

pump, and a compressor driven from one running axle. Each of the two pumps is powerful enough to meet the full demand for compressed air of the locomotive.

ELECTRICAL EQUIPMENT.

The electrical equipment comprises two sets identical in their essential parts, each set consisting of one current collector, one transformer with high-tension apparatus, one motor and one controlling gear outfit.

The diagram of connections is shown by Fig. 6; the arrangement is such that the locomotive can if necessary be

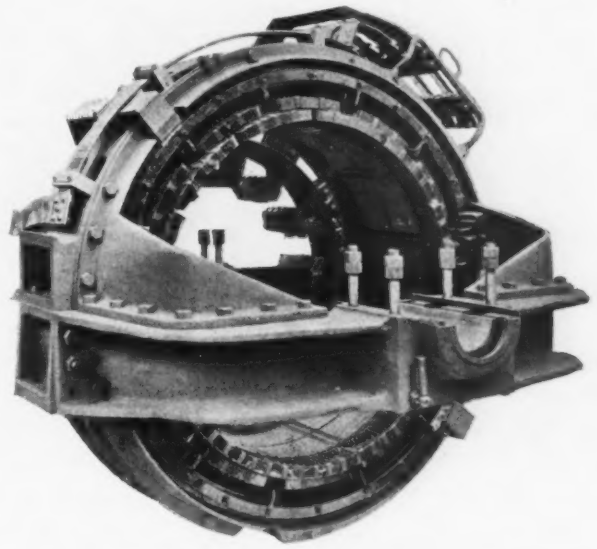


Fig. 8—Motor with Armature Removed.

run with only one motor, one transformer and one controller.

The current is taken from the line by means of two Siemens scissors bow collectors *T* and passes through a choking coil *J* to the high-tension oil-switch *A a*. From there the current passes to the commutating switches *A U h* through the high-tension windings of the transformers, connected in parallel, through a series transformer *S t h* feeding the high-tension ammeter *A h* and the current coil of the wattmeter *W*, and then to earth, through slip-rings fixed to two bogie axles. A shunt to the high-tension line is formed by a line branching off immediately beyond the current collectors and leading to earth through a lightning arrester of the horn type *B1*, fixed on the cage roof, and a resistor *C*, having a total resistance of about 3500 ohms and composed of a number of constantan asbestos strips immersed in an oil-bath.

The current collectors *T* are of the pantograph or scissors type, as employed by the Siemens-Schuckert Works. They have a total width of 1200 mm and are kept against the overhead line wire by means of springs, brought into action by compressed-air cylinders. The collectors are self-reversible and are specially designed to allow for the extreme differences of level of the contact line without appreciable variations of mechanical pressure on the wire. The difference between the highest and lowest position of the collector bows may be as great as 2550 mm.

The high-tension main switch *A a* is of the oil-break type, and fitted with an auxiliary contact which inserts a resistance before the switch can be closed completely. The high-tension main switch is operated from the driver's compartments by means of remote-control gear supplied with direct current. In case of excess current or no voltage the switch is automatically opened by means of time-limit and no-voltage relays. In case of emergency, the switch can also be operated by the use of a suitable key.

Each of the two transformers (Fig. 7) is designed for a continuous rated output of 1000 kva, when artificially air-cooled. They furnish the energy required for the motors, the auxiliary machinery and the heating of the cars. They have been so liberally dimensioned that even should the artificial cooling be interrupted they still can be left under pressure and give their full output for a considerable length of time. The artificially air-cooled transformer has been

preferred to the oil-cooled type owing chiefly to its lighter weight (5500 kg per transformer) and greater accessibility. The efficiency of the transformers, at all loads varying from 200 kva to 1300 kva, exceeds 95 per cent. The two iron cores of each transformer are placed horizontally side by

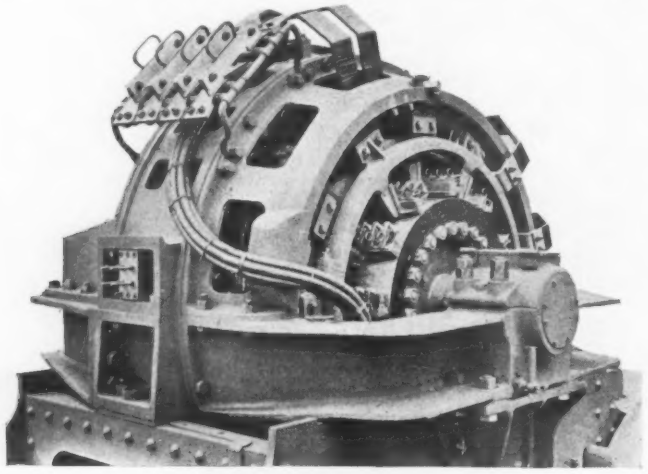


Fig. 9—Motor Mounted on Truck.

side. The low voltage winding on each core consists of one inner and one outer cylindrical winding, divided up in eight coils. Between the two low-voltage windings is placed the high-tension winding, which consists of two sections which may be connected in series or in parallel, so that, if necessary, the locomotive may also be run with a line pressure of 7500 volts. On the top of each transformer are fixed eight "step switches"—Nos. 1-16 in the wiring diagram—operated by direct-current remote control, which are connected with the low-voltage coils and which permit taking from the transformers sixteen different voltages, ranging from 0 to 420 volts. Normally the low-voltage transformer windings and the motors are connected in series, through the above-mentioned step switches. The line connecting the low-voltage windings of the two transformers is grounded, so that the difference in pressure between motor and earth cannot exceed 420 volts. Slots and ducts left in the iron cores and windings of the transformers insure uniform cooling.

The step switches mounted on the transformers are arranged in groups and are interlocked in such a way that only one switch of each group can be closed at a time. By this method the short-circuiting of transformer coils is excluded. To avoid interruption of the current supply when changing from one voltage to the other, the step switches are connected with an auto-transformer *A T*, from which the current passes through the controller to the motor. Each step switch consists of a pot-shaped magnet, the armature of which falls back by gravity.

The copper contact fingers are arranged above the magnet, the contacts of each pole forming a semi-circle. The circuit is closed by an iron cone fixed to the magnet armature spindle. The contacts are fixed by a bayonet-joint, thereby enabling a quick and easy replacing of any worn parts. Besides the above-mentioned contacts, each step switch has been provided with auxiliary contacts, which lead when closing and lag when opening the motor circuit and which are fitted with electromagnetic blow-outs.

The direction of running is controlled by a separate switch *U W* of the barrel type, operated by direct-current solenoids or, if necessary, by hand. The position of this switch is indicated in each driver's cabin by a pair of signal lamps, *v* (forward) and *r* (reverse), controlled by auxiliary contacts fitted on the reversing switch. A set of isolating links *U V* is further provided to effect the necessary changes in the connections should only one transformer and motor set remain for service.

The motors are shown in Figs. 8 and 9,. They are 12-pole Oerlikon compensated series machines with out-of-phase commutating field.

The frame is of cast steel and made in two parts, so that in lifting the upper part the rotor may be uncovered. The design of the frame is such that cooling air from all sides finds easy access to iron, windings and to the commutator, so that effective ventilation is assured even without artificial cooling. The rise in temperature, ascertained by a full-load test run of one hour (420 volts, 2100 amp) and without artificial cooling, amounted to 62 deg. C. on the collector, 52 deg. C. on the iron, 60 deg. C. on the stator windings and 75 deg. C. on the rotor windings. With artificial cooling the motor can give the above output continuously.

The stator windings comprise the exciting winding, which produces the magnetic field and which is connected in series with the rotor, and the compensating winding. Both windings consist of copper tape, insulated by mica and embedded in the uniformly distributed half-closed slots of the stator. The exciting and the compensating windings overlap by half a pole distance. Inside the compensating winding and inclosing one tooth is arranged the commutating-field winding, the current of which is caused to be out of phase with the armature current by a non-inductive resistance connected in parallel. This resistance is fixed directly below the motor on the bogie truck.

The exciting winding is calculated for starting the motors with the maximum torque without exceeding a pressure of 4 volts between adjacent commutator segments. The brushes cover as a maximum three commutator segments and do not cause any dangerous sparking.

The design of the rotor is indicated in Fig. 3. There are no resistances between the commutator and the armature windings. The connections consist of very large copper strips, dimensioned with a view to obtaining as great a mechanical strength as possible.

The brush holders are fixed to a ring-shaped support, which by means of pinion and gear wheel rim can be completely turned round the collector so that all brushes can easily be controlled and replaced.

The motors have a radial air gap of 3 mm (⅛ in.). The bearings are provided with ring lubrication and fitted with journals having a 2-mm lining of anti-friction metal. Even should this lining be worn completely, the rotor can never touch the interior stator facing. The spur gearing, referred to above, is fitted between the rotor and the motor-bearing opposite the collector.

Tests carried out have shown that the motor efficiencies between half and full load are 90 per cent and over, and

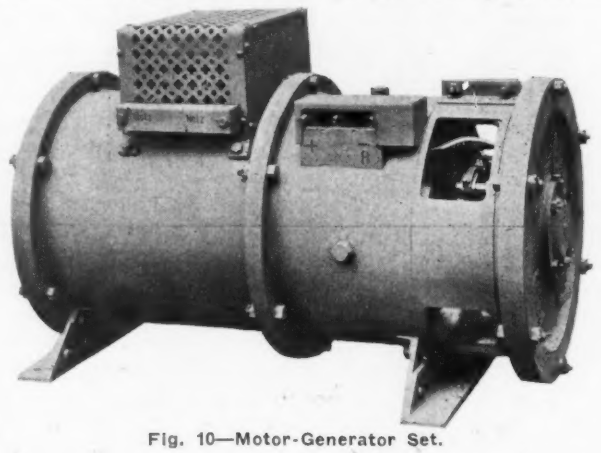


Fig. 10—Motor-Generator Set.

that the power factor, at speeds above 30 km per hour, exceeds 0.95.

Among the auxiliary equipment carried by the locomotive may first be mentioned a complete direct-current plant comprising a motor-generator *U G* of 1.2 kw output (Fig.

10) and a storage battery B_1 B_2 of 2×18 cells, having a total rated output of 81 amp-hours. This plant supplies the direct-current energy required for operating the magnet coils of all the high-tension switches, and also for lighting the locomotive. The converter starts automatically and puts itself in parallel with the battery as soon as the locomotive is under pressure. The battery is also automatically charged. The employment of direct current for operating the magnetic coils of the switch gear greatly simplified the construction of the regulating and the automatic switches.

The compressed air required for manipulating the current collectors, the Westinghouse brakes, the whistles and the sanders is furnished by a small air compressor set *P*, comprising a Westinghouse air compressor, driven through spur gearing by a 9-hp single-phase series motor. This set also starts automatically a switch *R p* opening and closing the motor circuit according to the pressure of the air contained in the pressure reservoir. This switch can be short-circuited in case it should fail to act. The pressure pump can in this case be operated by hand from the driver's cabins.

The cooling air required for the transformers and if necessary also for the motors is supplied by a low-pressure Sulzer fan *V*, driven by a 10-hp single-phase series motor.

The motors of the compressor set and of the low pressure blower are supplied with energy at 150 volts, whereas the motor of the motor-generator obtains energy at 300 volts taken from the secondary windings of either transformer.

The heating of the locomotive is done with energy at 300 volts taken from the secondary transformer windings. In each driver's cabin are placed three radiators, consuming 500 watts each. The heaters in the sand boxes consume about 100 watts. The heating of the complete train can also be effected with 300 volts energy, and for this purpose suitable single-pole heating couplings, capable of transmitting up to 100 kw, are fixed on either end of the locomotive.

The measuring and controlling gear comprises the following instruments, distributed in the two driver's cabins: Two high-tension ammeters *A h*, connected to high-tension series transformers *S t h;* two low-tension ammeters *A n*, connected to the low-tension series transformers *S t n;* two low-tension voltmeters *V n*, fed from the shunt transformer *S p*. By means of a number of change-over switches *U* and *V U* the shunt transformers may be so connected that with the voltmeters *V n* the secondary transformer voltage, or the pressure of the motors, singly or of both sets together, may be ascertained. In one cabin there is fitted a wattmeter connected to a series transformer *S t h*, and to a shunt transformer connected to the secondary windings of the main transformers. The remaining instruments are two direct-current voltmeters with voltmeter-change-over switches for measuring the generator, battery and lamp-voltage; two ammeters with series transformers *S t z* for the heating system; two Hasler tachographs, and four brake manometers.

The starting of the locomotive is effected as follows: When both current collectors are pulled down, that is, taken off the supply line, one of them is brought into contact with the overhead feeder by an air-pump operated by hand. By bringing switch *A a*, fitted on the control desk in the driver's cabin, to position *a c*, the high-tension main switch can be closed. This is, however, only possible when, by turning the valve of the air cylinder commanding the position of the current collectors to the "up" or "down" notch, the controlling current switch *A S* which is connected to the above mentioned valve is closed. The transformers are then under pressure and the motor-generator, the air-compressor set and the ventilator can be started. The air-compressor and the motor-generator afterward require no further attention, as they are controlled automatically. The second current collector is now brought in contact with the line by putting the air valve connected to switch *A S* on the "up" position. For running the locomotive, the master controller switch *v r* is put in the direction of running desired, whereby the commutating cylinder of switch *U W* is also operated and its position is indicated by one of the signal lamps *r* or *v*. The switch cylinder *K* of the master controller can now be manipulated. To pass from one running position to another, the switch cylinder must be turned around 360 deg. The position of the switch cylinder is shown by an indicator pointing to a dial plate numbered from 1 to 14. After the switch cylinder leaves the "off" position, the throwing over of the reversing switch is rendered impossible by a mechanical interlocking arrangement.

As the switch cylinder is turned the different electromagnetic switches are operated successively and the motors started. For stopping the locomotive the electro-magnetic switches are operated in the opposite succession by reversing the switch cylinder. If it should be desired to interrupt the supply suddenly, the high-tension main switch must be opened. The latter cannot be closed again before the switch cylinder has been put to the "off" position. The high-tension main switch may be opened either through switch *A a*, or through an overload time-limit relay *R h*, or a no-voltage relay *R n*. The overload relay is supplied with energy through the series transformer *S t h*, which is so arranged that it can equally well be used for the line emf of 15,000 volts or 7500 volts; the no-voltage relay interrupts the supply in case of default of the line pressure.

The official tests with this locomotive gave results that were satisfactory in every respect. The locomotive hauled a useful load of 481 tons on a gradient of 15 per cent, at a speed of 42 km (26 miles) per hour. The train, having been stopped on the grade, regained an equal speed after two minutes. If the speed at which the normal drawbar pull was required were nearer the maximum speed attainable with the equipment, the locomotive could, without necessitating an increase in weight and with only an unimportant modification of the secondary transformer winding, develop 3000 hp for one hour, at a speed of 60 km (37 miles) per hour.

AN APPROXIMATE METHOD OF DETERMINING POWER-FACTOR.

By C. M. JANSKY.

IN testing watt-hour meters it is often advisable to determine their accuracy at power-factors other than 100 per cent. The meter committee of the National Electric Light Association recommends that acceptable alternating-current watt-hour meters shall not be in error by more than ± 4 per cent on light load or full load the power-factor of which is 50 per cent, and not more than ± 2 per cent on loads the power-factor of which is 75 per cent. Determining the accuracy of watt-hour meters at these different power-factors necessitates some means of at least approximately calculating the power-factor at which the meter is tested.

The usual ammeter, voltmeter and wattmeter method of determining power-factor is used to a very limited extent in the smaller plants. The simple method discussed below is practically as accurate as this method at low power-factors. In plants using two-phase or three-phase generators the method will undoubtedly prove useful and accurate enough for commercial purposes. However, the method can be used only where two-phase or three-phase circuits are available.

Two-Phase Circuits.—The connections for testing the watt-hour meter on a two-phase, three-wire circuit are shown in Fig. 1. The series coil of the watt-hour meter carries the vector sum of the two currents in the different phases. When the shunt coil of the watt-hour meter is connected as indicated in the diagram the power-factor is the cosine of the angle between the series current and potential across AO. Thus, in Fig. 2, let OE represent the voltage between mains 1 and 2 and OE_2 the voltage be-

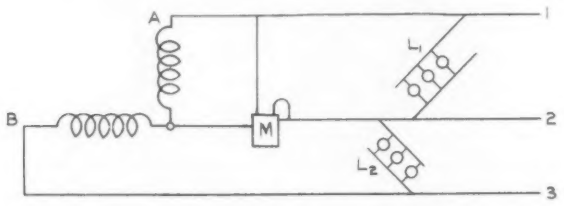


Fig. 1—Three-Wire, Two-Phase Circuit.

tween mains 2 and 3. Since the load is supposed to be non-inductive OI_1 and OI_2 may be considered as representing the currents in the separate phases. The current in main 2 is the vector sum of OI_1 and OI_2, and is, therefore, represented by OI or by the dotted line OI_0. The power-factor of the load registered by the watt-hour meter when connected as indicated in Fig. 1 is cos Θ, where Θ is the angle between OE_1 and OI. The value of Θ is determined by the relative values of currents in lamp banks L_1 and L_2. That is, if I_1 is the current in load L_1 and I_2 in load L_2, the power-factor is

$$\cos \Theta = \frac{I_1}{\sqrt{I_1^2 + I_2^2}}$$

and, hence, can be determined from the readings of two ammeters, one placed in main 1 and the other in main 3.

Since $\sqrt{I_1^2 \times I_2^2} = I$, the current in the series coil of watt-hour meter, an ammeter placed in main 2 will indicate $\sqrt{I_1^2 + I_2^2}$, or I. The power-factor then reduces to

$$\cos \Theta = \frac{I_1}{I}$$

When $I_2 = 0$, or the total load is on L_1, $I_1 = I$ and cos $\Theta = 1$. When $I_1 = 0$, the total load is on L_2 and $\cos \Theta = \frac{0}{I_2} = 0$.

Hence, by adjusting the load between L_1 and L_2 any power-factor between 0 and 1 can be approximately obtained and determined. According to the foregoing discussion two ammeters are needed; later it will be shown that the connections may be so made that one ammeter will suffice.

In case the generator is so wound as not to permit three-wire connection, which the foregoing method presupposes, a three-wire circuit can be obtained by connecting two transformers as shown in Fig. 3. The primary circuits of the transformers are connected to the separate phases of the generators and the secondaries are interconnected as shown.

Three-Phase Circuits.—In plants having three-phase alternators the same general plan may be used. When the series coil of the meter to be tested is connected to the middle wire, as indicated in Fig. 4, and the shunt coil is across E_1 the power-factor is

$$\cos \Theta = \tfrac{1}{2} \frac{I_3 - I_2}{\sqrt{I_2^2 + I_2 I_3 + I_3^2}} = \frac{I_3 - I_2}{2I}$$

where I, I_3 and I_2 are currents in middle and outside wires respectively.

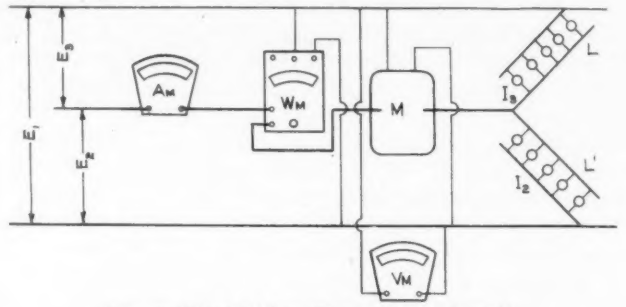


Fig. 4—Three-Wire, Three-Phase Circuit.

When the shunt circuit is connected across E_3 the power-factor is

$$\cos \Theta = \tfrac{1}{2} \frac{2I_3 + I_2}{\sqrt{I_2^2 + I_2 I_3 + I_3^2}} = \frac{2I_3 + I_2}{2I}$$

These formulas can be derived as follows: Assuming the time-phase displacements of the emfs of the three-phase generator to be 120 deg., the quantities involved can be represented as in Fig. 5. From this diagram it is plainly evident that both the magnitude and the time-phase of I with reference to E_1 depend upon the relative magnitudes of I_2 and I_3.

Let Θ be the angle between E_1 and I, then the angle between I_3 and E_1 is 60 deg. when the load is non-inductive. Hence,

$$\cos \Theta = \cos (y + 60 \text{ deg.})$$
$$= \tfrac{1}{2} \cos y - \tfrac{1}{2} \sqrt{3} \sin y$$

From the triangle whose sides are I, I_2 and I_3

$$I_3 : I_2 :: \sin (60 \text{ deg.} - y) : \sin y.$$

Whence

$$\sin y = \tfrac{1}{2} I_2 \sqrt{\frac{3}{I_2^2 + I_2 I_3 + I_3^2}}$$

and

$$\cos y = \tfrac{1}{2} \frac{2I_3 + I_2}{\sqrt{I_3^2 + I_2 I_3 + I_2^2}}$$

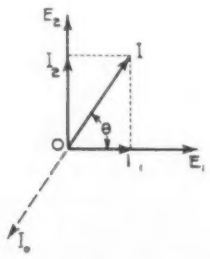


Fig. 2.—Vector Relations in Two-phase Circuit.

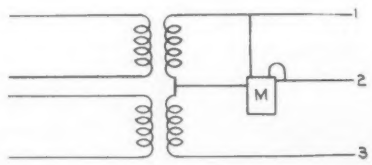


Fig. 3—Three-Wire Circuit Obtained by Transformation.

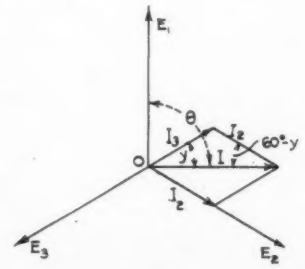


Fig. 5—Vector Relations in Three-Phase Circuit.

Substituting these values in the expression for cos Θ and reducing,

$$\cos \Theta = \tfrac{1}{2} \frac{I_3 - I_2}{\sqrt{I_3^2 + I_3 I_2 + I_2^2}}$$

But

$$\sqrt{I_3^2 + I_3 I_2 + I_2^2} = I$$

Hence,

$$\cos \Theta = \tfrac{1}{2} \frac{I_3 - I_2}{I}$$

When $I_2 = I_3$, or when both phases are equally loaded, cos $\Theta = 0$. When $I_2 = 0$, $I_3 = I$ and cos $\Theta = 0.5$, and when $I_3 = 0$, $I_2 = -I$ and cos $\Theta = -0.5$. Hence by such a connection the power-factor can be varied between -0.5 and $+0.5$.

When the shunt circuit is across E_3 it can readily be shown that the power-factor

$$\cos\Theta = \tfrac{1}{2}\,\frac{2I_3 + I_2}{\sqrt{I_3^2 + I_2 I_3 + I_2^2}} = \frac{2I_3 + I_2}{2I}$$

When $I_2 = 0$, $I_3 = I$, and $\cos\Theta = 1$. When $I_3 = 0$, $\cos\theta = 0.5$. That is, when all the load is on L the power-factor is 1, and when all the load is on L' the power-factor is 0.5.

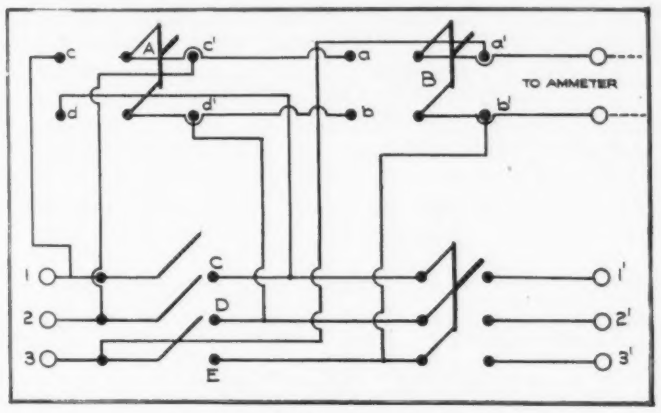


Fig. 6—Switchboard Connections.

The advantage of this method lies in the ease with which both the connections and calculations may be made. The ordinary ammeter, voltmeter and wattmeter method necessitates three instruments, and it is well known that at low power-factors the inductance of the shunt coil of the wattmeter introduces an error which is proportional to $\sin\Theta$. This error may be as great as that due to the unbalancing of pressures in the method under consideration. The fact that one ammeter is sufficient makes this method especially advantageous for small power plants where the supply of instruments is limited.

TABLE I.—COMPARISON OF METHODS OF MEASURING LOW POWER-FACTORS.

I_3	I_2	$I_3 - I_2$	I	E	Watts.	$\frac{W}{I \times E} \times 100$	Cos θ per Cent.	Difference.
8.2	4.0	4.2	10.0	109.0	250	23.0	21.0	−2.0
8.15	6.0	2.15	12.4	109.0	55	4.0	8.7	+4.7
8.1	8.0	0.1	13.75	109.0	0	0	0	0
8.04	12.0	− 3.9	17.25	109.0	−200	−10.6	−11.3	+1.3
8.00	14.2	− 6.2	19.5	109.0	−350	−16.5	−15.9	−0.6
10.25	15.5	− 5.25	22.25	108.0	−300	−12.4	−11.8	−0.6
10.25	18.0	− 7.75	24.75	117.0	−450	−17.0	−15.75	−1.25
10.3	23.0	−12.7	29.00	110.0	−750	−23.5	−22.00	−1.5
10.35	25.5	−15.15	31.90	110.0	−950	−27.0+	−24.0	−3.0
15.75	12.75	3.00	25.00	110.0	+ 50	1.8	6.00	+4.2
18.5	12.75	5.75	27.50	108.5	−200	6.7	10.6	4.00
20.75	12.75	8.00	29.5	107.0	300	9.5	13.5	4.00
23.00	12.75	10.25	31.90	107.0	400	11.8	16.05	4.25

In order to use only one ammeter a polyphase switchboard must be provided. Fig. 6 shows the connections of such a board which is used in the electrical laboratory of the University of Wisconsin. The three mains are connected to binding posts 1′, 2′, 3′, and the three load terminals to posts 1, 2, 3, while the ammeter is connected to the leads indicated. An examination of the diagram will show that when the three-pole and the three single-pole switches are closed the ammeter will register no current. When, however, both double-pole, double-throw switches are closed to the left, and the single-pole switch C is opened, the ammeter will register the current in lamp bank between mains 1 and 2. An examination of the diagram will make clear the operation necessary to ascertain the current in the other lamp bank and that in the middle wire.

Comparison of Methods.—In order to know something of the accuracy of the method a comparison was made between power-factors calculated from ammeter readings and from the ordinary three-instrument method. For this purpose a 110-volt, 96-amp, three-phase generator was connected to two lamp banks. The instruments were of the ordinary laboratory type that had been used for some time by students in experimental work. The accompanying data show clearly the maximum error that one may expect with commercial, inaccurate instruments. The writer has not had the time to compare results obtained by the two methods when accurate instruments are used.

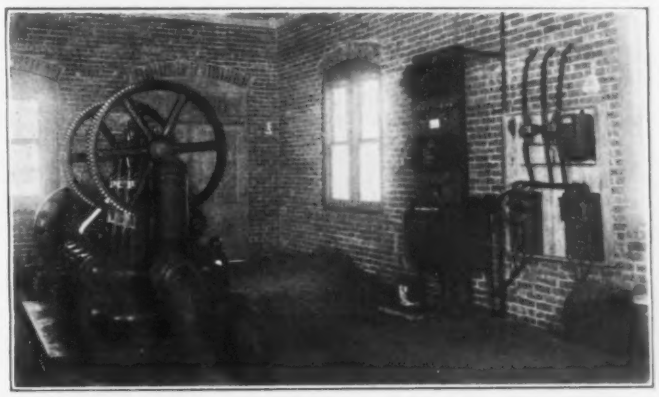
TABLE II.—COMPARISON OF METHODS OF MEASURING HIGH POWER-FACTORS.

I_3	I_2	I	E	Watts.	$\frac{W}{I \times E} \times 100$	Cos θ x 100	Difference.
5.3	7.72	11.50	110.0	1100	87.0	90.0	+3.0
7.0	9.65	14.25	110.0	1440	92.0	92.0	0.0
4.45	9.78	12.50	111.0	1300	94.0	96.0	+2.0
1.8	9.85	10.75	111.5	1150	97.0	99.0	+2.0
0.0	9.95	10.00	112.5	1150	102.0	100.0	−2.0?
9.2	9.80	16.00	110.0	1525	86.7	89.0	+2.3
9.03	7.95	15.75	111.5	1350	77.0	79.0	+2.0
8.1	0.0	8.00	113.5	425	46.25	50.0	+3.75
10.25	0.0	10.25	112.5	540	46.85	50.0	+3.2
18.00	0.0	18.00	111.0	900	45.5	50.0	+4.5
20.50	0.0	20.50	110.5	1025	45.25	50.0	+4.7
20.5	26.25	38.75	106.5	3650	91.0	92.0	+1.0
20.6	20.5	35.50	108.0	3300	86.0	86.7	+0.7

Tables I and II show that the greatest difference is not over 5 per cent. Since in one case the three-instrument method indicated a power-factor of 102 per cent it is safe to say that the results are probably not greatly in error. Since a difference of 5 per cent in power-factor will have very slight effect upon the registration of watt-hour meters, it seems that the method is accurate enough for commercial work.

UNIQUE MOTOR-DRIVEN WATER-SUPPLY AND FIRE-PROTECTION SYSTEM.

Boyne City, Mich., is a town of 2000 population near the northern end of the lower peninsula of the State. Its water supply is derived from a well, and is pumped by means of an air lift, delivering into a low-level receiving basin from which the high-duty pumps force the water to the reservoir on a hilltop 250 ft. above the town. The main supply to the town is through a 12-in. pipe in which, at the city limits, is inserted an electrically controlled gate, by-passed by a pressure-reducing valve. Normally the gate valve is closed, passing the town water supply through the reducing valve and so lowering its pressure from 115 lb. to 40 lb. per square inch for domestic use. In case of fire in the town the electrically operated gate valve can be opened from the fire-department office, at once impressing the entire 115-lb. pressure of the reservoir onto the town mains. With this pressure no fire engine is needed to throw a good stream over any house in Boyne City.



Motor-Driven Pump and Central Panel, Boyne City, Mich.

The main lift pump is of the triplex-plunger type driven by a slip-ring induction motor. The pump delivers directly into the 12-in. main pipe between the gate valve and the reservoir. When in operation this pump supplies a greater volume of water than the town demands at any time, so that the pump is continually making delivery to the reservoir. When the level of the reservoir has risen to a predetermined height the pump is automatically shut off, being again started when the reservoir falls a given amount.

This automatic control of the pump motor is effected by a float at the upper reservoir controlling the circuits of the automatic starting panel in the pump house half way down the hill. On account of the exposed position of the float and the severe climate to which it is exposed a pilot pipe filled with oil has been provided in which the float moves. This pipe is tapped from the lowest level of the reservoir so as to be unaffected by ice on the surface. The oil line is also so arranged that in case the reservoir be drained the oil will not be spilled. Normally this float contact controls the pilot circuit of the Cutler-Hammer full-automatic self-starting panel for the pump motor, but if desired the float control can be cut out by opening a double-pole switch, leaving the motor to be started from the panel by hand. The latter feature makes it possible to keep the motor off the line during hours of heavy load on the generating station. The Westinghouse motor driving the high-duty pump is protected by an oil switch, which also serves as a circuit-breaker. The Laidlaw-Dunn-Gordon air compressor used for blowing the well is driven by an Allis-Chalmers squirrel-cage motor. The attendant in charge of the station visits it during a short time each day to inspect the operation of the equipment.

Central Station
Management, Policies and Commercial Methods

SMALL-RESIDENCE LIGHTING.

An interesting discussion of small-residence lighting as a profitable central-station load will be found in the account given under "Wisconsin Commission News" of a recent decision of that body affecting the Beloit Water, Gas & Electric Company.

MOVING WINDOW DISPLAYS.

A prize of $10 will be awarded for the best suggestion for a moving window display which can be used in one of the windows of the Electric Shop of the Commonwealth Edison Company, Chicago. All suggestions must be sent to the manager of the Electric Shop before Aug. 1. A drawing and a full explanation are asked, any employee of the company being eligible to take part in the competition. Moving window displays of electrical apparatus prove a decidedly popular attraction, and a recent display of electric laundry machinery of this character in the windows of the Electric Shop attracted wide attention.

TAKING ADVANTAGE OF FRUIT-PRESERVING TIME.

During the fruit-preserving season the Electric Shop of the Commonwealth Edison Company, Chicago, issues an attractive booklet entitled "The Corcorans' House Party," obtaining its title from a little bit of fiction which forms the major part of the book. However, a number of gummed preserving labels for strawberries, cherries, chili sauce, etc., are included in the book, and no doubt housewives will find these very convenient, as it is only necessary to moisten and attach them to jars or jelly glasses. Attention is also attracted to the electric sealing-wax pot, which is very convenient during "putting-up" season, as it furnishes a practical and easy method of using sealing wax.

"RE-CONNECT" POST CARDS FOR VACANT HOUSES.

When a salesman or representative of the Union Electric Company, of St. Louis, has occasion to visit a vacant house the wiring of which has been temporarily disconnected and the meter removed awaiting reoccupancy he is instructed to place somewhere in full sight of those entering the building a special printed post card, which, when filled out, instructs the company to call and make re-connections. The card gives the name and address of the customer, and space is left for inserting the number of lamps which are required. The presence of these cards is believed to serve as a useful reminder in having the re-establishment of service ordered without delay.

THE ELECTRIC-LIGHT EMPLOYEE AND THE PUBLIC

To the public and to the consumer of central-station service the expression and behavior of every employee of the company become directly representative of the policy of the company itself. For this reason care must be taken that all members of the organization, from manager to cashier and meter-reader, be imbued with the idea of unfailing tact and courtesy in handling customers. As a reminder of its employees' duties to those outside the organization the North Shore Electric Company, of Chicago, has caused the following notice, signed by Vice-president Frank J. Baker, to be posted in its offices:

To Employees:

Don't forget that you are in the service of the public.

Treat all customers politely and courteously.

Don't try to be smart.

Don't misrepresent anything.

Don't think that you are doing the company any favor by beating a customer on a deal.

The motto of this company is, "A Square Deal to the Public." See that you help us live up to it.

ST. LOUIS CENTRAL-STATION SERVICE SUPPLANTS LARGE ISOLATED PLANTS.

The Union Electric Light & Power Company has just taken over two of the largest remaining isolated plants in St. Louis, the Cupples Station and the Grand Leader department store. The central-station company will furnish the department store with service from its Ashley Street station six months in the year, during the winter months taking over the operation of the store steam plant as an auxiliary to its steam-heating system. The Cupples Station system will receive central-station service from May to October, again running as an isolated plant in the steam-

heating season. The Cupples Station has a city franchise and supplies electricity and heat to 26,000,000 cu. ft. of buildings covering fourteen city blocks. The sixty-six hydraulic elevators in these buildings will be converted to motor drive, making seventy electrically operated elevators in the group. The power plant for which central-station service is substituted comprises two 125-kw turbine generators and engine-driven units, bringing the total rating up to 500 kw. The Grand Leader department store, occupying a whole city block, also has generating equipment aggregating 500 kw. This store has contracted to use 1,500,000 to 2,000,000 kw-hours of electrical energy annually. A large seven-story building belonging to Schmitz & Schroeder has also recently been converted from isolated-plant to central-station service. The foregoing contracts were taken at the standard schedule of rates of the Union Electric Light & Power Company.

HOW AN ELECTRIC-VEHICLE LOAD WAS CREATED AT SPRINGFIELD, ILL.

Until a year ago Springfield, Ill., had practically no electric vehicles. Realizing the value of such a charging load from the point of load-factor, the local central-station company began an extensive advertising campaign in the Springfield newspapers. In these half-page and full-page advertisements the general advantages of electric vehicles were set forth without particular reference to any manufacturer, the display closing with the names and addresses of all the electric-automobile representatives in town. In 1910 the company expended $300 in this educational publicity, and during the first three months of 1911 a similar amount of space was used. Besides the newspaper advertising carefully prepared circular matter was sent to a selected list of local people whose circumstances justified the purchase of electric machines.

Within hardly more than a year from the beginning of the campaign there are to-day fifty vehicles in Springfield, a city of 50,000, and the presence of these cars is attributed entirely to the publicity work done. The expenditure for advertising, according to Mr. C. L. Owen, new-business manager for the company, has proved an excellent investment. Other vehicles are being rapidly added to the present number, and the income from these cars provides a good return on the initial outlay.

The majority of the electric vehicles in Springfield are pleasure vehicles and are housed in private garages. Charging service is supplied through a separate meter under off-peak conditions at 4½ cents per kw-hour.

ELECTRICAL ENERGY FOR ICE MAKING.

Very few electric-service companies sell electrical energy to outside customers engaged in the manufacture of artificial ice. It is, therefore, of interest to note that the Commonwealth Edison Company of Chicago has two customers of this description on its circuits at the present time, and will soon have a third one. The Lincoln Ice Company, which has a plant at Carolina and Elizabeth Streets, has an installation of about 450 hp in alternating-current motors used to drive compressors, pumps, hoists, etc. This plant has a capacity for producing 120 tons of ice every twenty-four hours, and it is operated throughout by electrical energy. Filtered water from Lake Michigan is used to make the ice, so that the method is essentially a raw-water ice proposition, in which central stations are particularly interested, because it is difficult to sell electrical energy for ice manufacture where a steam plant must be used to make distilled water.

Anderson & Goodman have an 80-ton plant at South State and Forty-third Streets. Here the electric-motor equipment has a rating of about 350 hp. Both plants operate twenty-four hours a day at this time of the year. They buy electrical energy from the electric-service company on what is known as the "off-peak schedule," by which a reduced rate is offered in consideration of the fact that the consumer agrees not to take electricity between the hours of 4 p. m. and 8 p. m. during the months of November, December and January. By reason of the continuous demand and the concessions made in the off-peak schedule, the ice makers are able to obtain a very low rate for electrical energy, being, in fact, in the neighborhood of 1 cent a kw-hour. The annual load-factor of this class of customers will figure out about 70 per cent. In view of this high load-factor, although the consumer gets such a low rate, the business is satisfactory to the central-station company and constitutes a very desirable summer load.

The Knickerbocker Ice Company, one of the well-known ice producers of the country, will place in operation an electrically driven 80-ton ice plant at Marshfield Avenue and West Van Buren Street, Chicago, very soon, buying energy from the Commonwealth Edison Company.

ADVERTISING A CITY COUNTRY-WIDE WITH ELECTRIC SIGNS.

To remind folk in other cities of St. Louis' advantages as a manufacturing center, and to advertise its telling

"Some Cities Have a Slogan
St Louis has the Goods"
THIRTY MILLION PEOPLE
WITHIN 12 HOURS TRAVEL OF ST LOUIS.
SUPERB FACTORY LOCATIONS - COAL $1.49 PER TON
ADDRESS ST LOUIS LEAGUE OF ELECTRICAL INTERESTS
This SIGN now appearing in New York, Chicago, Philadelphia, Boston and Buffalo.

Electric Sign Advertising St. Louis.

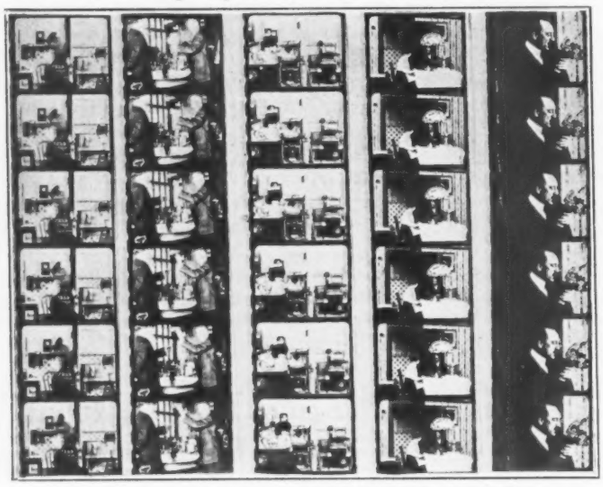
motto, "Some Cities Have a Slogan, St. Louis Has the Goods," the St. Louis League of Electrical Interests, composed of local electrical men, has had electrically lighted signboards erected in a number of Eastern cities, similar to the St. Louis display herewith reproduced. These signboards are 12 ft. high and from 50 ft. to 25 ft. long, and have already been placed in New York, Chicago, Philadelphia, Boston and Buffalo.

In addition to the illuminated signboards at St. Louis the Union Electric Light & Power Company is arranging to erect a huge display sign containing 500 lamps and letters 4 ft. high on the St. Louis armory building. This sign will bear the words "St. Louis Has the Goods" and will be constructed and operated entirely at the company's expense as a matter of public enterprise.

SOLVING THE SERVANT PROBLEM WITH ELECTRICITY; A MOVING-PICTURE DRAMA.

The accompanying illustrations show several sections of the moving-picture film to demonstrate central-station service now being exhibited nightly by the Commonwealth Edison Company of Chicago at its White City auditorium. The simple but engaging plot of this little domestic drama, "Solving the Servant Problem," was outlined on page 457 of the *Electrical World* of June 1.

The strip of pictures at the left is one of the opening scenes of the sketch, and shows the untidy servant girl in her ludicrous efforts to get breakfast on the smoking coal stove, while the family waits hungrily in the dining-room. The second strip depicts the head of the house in the



The Servant Problem on a Moving Picture Film.

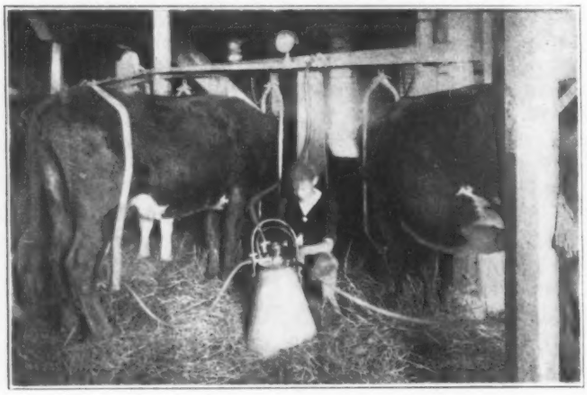
electric shop of the Commonwealth Company making his selections of electric household appliances. These purchases, which include a complete electric kitchen and laundry, are shown in the third strip, while in No. 4 are seen the happy couple enjoying their first electrically prepared meal. The film, which is 1500 ft. in length, closes with a series of character studies of the man of the house, his cigar and his electric cigar lighter.

The Commonwealth Edison Company last year employed moving pictures to demonstrate the use of electric appliances, but these earlier films, which showed mere operations only, lacked popular interest. In the present series, however, the numerous electrical incidents have been gathered together in the form of a connected story which holds attention and interest throughout the exhibition of the film, and no spectator ever leaves the White City exhibit hall until the last picture has been run off.

RURAL ELECTRICAL SERVICE.

By J. C. Hoetger.

Situated 2 miles west of Mount Clemens in the township of Clinton, Mich., is the 80-acre dairy farm of Mr.



Vacuum Milking Machine.

Frank G. Hacker, the show customer of the rural districts covered by the Eastern Michigan Edison Company, St. Clair Division.

Two years ago Mr. Hacker, after careful investigation, adopted the vacuum milking system and installed a 6-in. x 6-in. x 3½-in. vacuum pump, operated by a 5-hp motor. There are two milk receptacles with attachments for milking four cows at a time. Forty cows are the average number kept on the farm, and by using the two milking machines, drawing on four cows at the same time, the entire forty are gone over by one man in two hours. Mr. Hacker soon after installing his milking apparatus saw great possibilities ahead for other uses for his vacuum system and his electric motor. He now has his farm residence piped in connection with the vacuum pump for cleaning the carpets, rugs, mattresses, etc., the dirt being drawn by suction through these pipes to the cellar.

The electric motor has been made to take the place of the windmill, and by simply turning a switch the motor pumps water for the house, for the stock and the garden. The motor is also utilized for grinding corn, running a grindstone and sawing wood. Mr. Hacker says he can now saw enough wood in one hour for a week's supply, while before the work was a long daily task. In the two years electricity has been used for power on the Hacker farm the average cost has not been over $10 per month.

The St. Clair division of the Eastern Michigan Edison Company has another stretch of rural customers between Port Huron and St. Clair, Mich. They are supplied from a 15,000-volt transmission line from Port Huron for a distance of 4 miles, where a transformer, boxed and fastened on a pole, steps down to 2300 volts. The 2300-volt line is extended for 8 miles and is now furnishing current for light and power to twenty-five customers, and it is expected to add twenty-five more shortly. A number of customers have motors from 1 hp to 5 hp connected for pumping water, feed grinding, etc.

NEW-BUILDING PROMOTION WORK.

With an eye to the future the Commonwealth Edison Company of Chicago sends out letters to owners and architects of new apartment buildings calling their attention to the advantages of an electric laundry in the building. It is pointed out that the advantages of an electric laundry are very obvious, being of real assistance to housekeepers and giving the renting agents a good talking point which will assist them in securing good tenants. The cost of installing an electric washing machine and an electric mangle in the laundry of the apartment building is really as nothing compared with the benefits to be derived from the installation.

Attention is also directed to the matter of placing the necessary baseboard outlets for the use of portable vacuum cleaners in the different rooms of the various apartments, as well as an outlet for the attachment of an electric flatiron in the kitchen. These outlets are very essential nowadays, when electricity is being used for so many different purposes in the home. If the work is done before the building is completed much annoyance and expense can be saved both by the owner and tenants. If desired, an installation may be made for a stationary vacuum-cleaning system by installing a riser under each floor and placing the vacuum machine in the basement with a plug attachment so that each tenant may attach the cleaner motor to his own meter.

NEW BUILDING OF THE BUFFALO GENERAL ELECTRIC COMPANY.

The contract for the construction of the new building of the Buffalo General Electric Company was recently let to John Gill & Company, of Cleveland, Ohio. The work of erecting this building is now under way, and the building will be ready for occupancy by May 1, 1912. The building,

located at the intersection of Genesee, Washington and Huron Streets, will be 300 ft. in height, the tallest building in the city. The lower portion will be of granite, with the upper stories of brick and terra cotta. The first two floors, covering the entire site, will be occupied by the Buffalo General Electric Company and the third floor by the Cataract Power & Conduit Company. The upper floors in the tower will be rented for office purposes. The interior finish will be of mahogany. On the first two floors of the

Buffalo General Electric Company's Building.

building will be located the general offices of the Buffalo General Electric Company, contract department, construction department, meter department, etc. In the basement will be a large display-room. A rotary-converter substation and a large storage battery will also be located in the basement. The top floor of the building will be used for an assembly room for employees of the company. The plans for the illumination of the building are in the hands of Mr. W. D'A. Ryan, illuminating engineer of the General Electric Company.

PRIZES FOR EMPLOYEES' HINTS AND IDEAS.

In the business office of the Springfield (Ill.) Light, Heat & Power Company a special letter box has been put up bearing the words "Brighter Springfield," and into this box employees and others are urged to place, in written form, all ideas or suggestions that will benefit the service. To its employees the company has also issued numbered books of blank forms, and for the best suggestions received cash prizes are offered. The awards are made every three months and consist of four prizes of $5, $2.50, $1.50 and $1 respectively. All of the company's street-railway, gas-department and electric-lighting employees are eligible in the prize contests, although, of course, the greatest interest has been displayed by the office staff itself.

The scheme was inaugurated six months ago and immediately began to show results. The suggestions received have included many hints for the improvement of office and plant routine, but the results of chief value have come in the form of "tips" regarding prospective customers, present consumers who plan extensions in equipment, customers complaining of service, etc. These hints on the location of "prospects" enable solicitors to be dispatched to the addresses given without delay, and they usually close with the customer before his mood changes. One instance showing the value of the suggestion box was in the case of a customer who felt dissatisfied with his service and planned to put in a gasoline plant. A central-station employee having no direct connection with the sales department heard of the contemplated change and explained the situation on a slip in the suggestion box. A solicitor immediately called on the customer and by his arguments was able to induce him to continue to use electric service.

The contents of the suggestion box usually cover a wide range of subjects—"prospects," dissatisfied customers, consumers ready to buy apparatus, wires down, lamps out, services interrupted, inoperative apparatus, etc., and, while some chaff is necessarily uncovered, on the whole a great deal of valuable material is contributed as long as interest is kept lively in the suggestion box.

Wiring and Illumination

REFLECTING GLASSWARE.

By J. R. CRAVATH.

One of the effects of the illuminating engineering movement of the past six years has been an increased interest in glassware which combines reflecting and diffusing properties in such proportions as to fit it for reflectors for incandescent lamps. In the ordinary use of incandescent lamps it is desirable to employ reflectors which will reflect into the lower hemisphere a certain proportion of the light from the lamp and allow some light to pass through the reflector for the illumination of ceilings and walls.

The oldest variety of translucent glassware meeting these requirements was opal, which has in it a large number of suspended reflecting particles. The light which passes through opal glass is thoroughly diffused because of being reflected from one particle to another, and not passing straight through as in the case of clear glass. At the same time many of these particles reflect the light back to the side of the glass whence it came, and some light is also reflected from the polished surface of the glass. If opal were patented and could be pushed by some one company as a specialty or novelty at a good margin of profit without danger of competition, it would doubtless be much more popular than it is at present. Unfortunately it is so staple and well known that no manufacturer has seen fit to spend much money in pushing reflectors of plain opal for the simple reason that no exclusive trade can be built up with it.

Of the translucent reflectors the prismatic type has been most extensively sold during the past few years. These depend on the principle of total reflection with 90-deg. prism for reflecting the light, while sufficient light passes directly through the reflector at the apexes and bottoms of the prisms to bring these reflectors into the translucent class. When built of clear glass prismatic reflectors have a very low absorption; that is, a very small amount of light is lost either in the process of reflection or in passing through the glass. The prisms render them more difficult to clean than plain, smooth reflectors.

Glass which has been roughened by sand blasting or acid etching has been used to a limited extent for reflectors. Such glass allows a larger percentage of light to pass through than does opal or prismatic. The general effect is pleasing, but the impossibility of cleaning after dirt has once been rubbed into the roughened surface is a serious objection.

Recently a large number of new kinds of glass have been brought out under various trade names for use as tungsten-lamp globes and reflectors. This fact indicates commendable enterprise and investigation on the part of glass manufacturers, and it is hoped that the good work will continue. In the numerous varieties of reflecting glassware recently brought out there is not as much essential difference as the large assortment of trade names would indicate, but there is one movement in glass manufacture which is especially worth noting at this time, namely, the production of a translucent glass with a smooth surface which presents some of the pleasing appearances of sand-blasted or etched glass, together with the smooth, easily cleaned surface of opal and reflecting qualities of opal. Most of these new varieties of glass give light distribution very similar to opal when made up in similar shapes of reflectors. When made up in thin globes the effect is very similar to sand-blasted or acid-etched globes and the total absorption of light in passing through the globe is about the same, but opal possesses the important advantage of having no roughened surface to become filled with dirt.

Another line of development has been the production of opal glassware with the surface modified in some way so as to produce a slightly different effect from regular opal. All of these efforts are commendable as they place at the disposal of the purchaser a much larger selection of good reflecting glassware than was possible a few years ago. Some manufacturers have gone into the matter of scientific design of the shape of the reflector very fully, while others have apparently simply copied other designs with modifications to produce something slightly different in appearance, which modifications have not always been for the best. Apparently there has not yet been produced a glass of low absorption, like acid-etched or sand-blasted glass, which can be obtained in plate form for use in sky-windows, lanterns, etc., but will have the smooth finish which makes effective cleaning possible. Practically all of the plain diffusing glass now obtainable has such a rough surface that cleaning is difficult, or else the absorption is so great that it is almost prohibitive with artificial light. There is good reason to suppose, however, from the work already done with reflecting shades that plain plates can be obtained combining low absorption of light with smooth surface suitable to cleaning and sufficient diffusion to avoid showing the lamp filament through the glass.

ILLUMINATION AT ROCHESTER, N. Y., IN HONOR OF MYSTIC SHRINERS.

An account was published in these columns on July 15 of the electrical decorations in Rochester, N. Y., for the convention of the Imperial Council, Ancient Arabic Order, Nobles of the Mystic Shrine, held July 10 to 13 inclusive. The two engravings published herewith show portions of Main Street during the celebration. The canopies, the colored lamps in which do not show in the engravings, are suspended from cables at the intersections of the principal thoroughfares and also between blocks. Each holds about 1500 30-watt lamps and is a permanent feature for the rest of the season.

Rochester has become quite a convention city, and in order to avoid the expense of erecting and removing the canopies for the various large gatherings arrangements have been made to retain the chief decorative features of the illuminating scheme on the main thoroughfare of the city. Main Street is the great business and shopping thoroughfare of

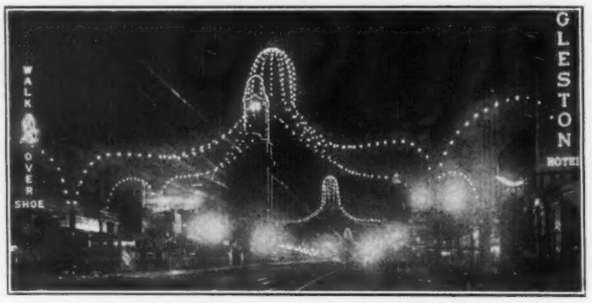


Fig. 1—Main Street, Rochester, During Shriners' Convention.

Rochester, no other street sharing the honor; so that it is the center of activity by night and by day of the Flower City.

The avenues leading from the five stations of the trunk lines reaching the city were decorated with stringers festooned from pole to pole parallel with the sidewalk from the stations to Main Street. In all 5 miles of festoons were required for this work. Various emblems of the order, such as the star and crescent, camel, etc., were outlined in light in many places, and on Main Street there were two

Fig. 2—Main Street, Rochester, During Shriners' Convention.

large animated signs hung across the thoroughfare, one depicting a camel walking and the other a man climbing a rope. The significance of both are known to members of the order.

ELECTRIC ILLUMINATION FOR RELIGIOUS FESTIVAL.

The New York Edison Company has developed a unique field of celebration illumination on the upper East Side in the section known as "Little Italy." Here some 200,000 Italians come together every year from all over America to celebrate the festival of Our Lady of Mount Carmel. It is utterly impossible for this great body of people to find lodgings among the residents of the section, so many thou-

sands sleep in Thomas Jefferson Park, which extends from East 111th Street to East 114th Street, and from First Avenue to the East River. The pilgrims come from distant Winnipeg, in Canada, from the South and the West and all parts of the United States, to do homage to Our Lady of Mount Carmel.

The celebration lasts for three days, July 15, 16 and 17, although the sixteenth is the real day of the festival. The devotees show their religious gratitude by marching for hours barefooted and carrrying can dles in a long procession that winds its way though the streets of "Little Italy." Finally they lay their candles and other offerings at the foot of the shrine of Our Lady of Mount Carmel, in

Fig. 1—Illumination on First Avenue, New York.

the church at 447 East 115th Street. This is the largest Italian church in New York.

Until four years ago the streets were meagerly illuminated for the celebration with little kerosene oil lamps in colored-glass cases. It was four years ago that Mr. Meara, manager of the Harlem district for the New York Edison Company, and Mr. Friend, his assistant, went into "Little Italy" and showed the residents what could be done in the way of electric illumination, and since then thousands of lamps have been used every year.

This year the front of the church was festooned with lamps, the American and Italian flags were reproduced in electric lamps, and Our Lady of Mount Carmel was pictured in the light of 300 lamps in Jefferson Park. First Avenue was illuminated from 106th Street to 116th Street, and 114th and 115th Streets were illuminated from First Avenue to Pleasant Avenue. The illumination extended all the way around Thomas Jefferson Park.

For the celebration lighting in the streets 6000 8-cp lamps were used, together with 200 32-cp lamps. More than 3000 lamps were used on the front of private property outside

Fig. 2—Illumination on East 115th Street, New York.

of the street illumination, and it is estimated that altogether fully 10,000 lamps were in use. They were lighted from 8 o'clock until midnight on the three nights of the celebration, and the illumination thus afforded, which far surpassed that given by the crude methods at first in vogue, aroused much enthusiasm among the impressionable dwellers in the district.

SPECTACULAR ILLUMINATION AT RICHMOND, IND.

During the recent encampment of the Grand Army of the Republic at Richmond, Ind., Main Street was handsomely

Main Street, Richmond, Ind., During G. A. R. Encampment.

decorated with bunting and flags and in addition the Richmond Light, Heat & Power Company arranged spectacular illumination of the thoroughfare at night. Incandescent lamps were festooned across the roadways, as indicated in the engraving herewith, and at the corners four illuminated columns were provided besides the two stringers of lamps which crossed diagonally from curb to curb. The court house and high school were outlined in red, white and blue lamps and the contrast of the vari-colored lamps with the green leaves was strikingly beautiful. The decorations were arranged by Mr. Fred Schornstein, the manager of the lighting company, and the veterans are said to have expressed much pleasure with the display made in their honor.

RECENT TELEPHONE PATENTS.

LOCK-OUT PARTY SYSTEM.

A lock-out party-line system of the sectional-line type forms the subject of a patent granted to Mr. H. J. Roberts, of Evanston, Ill., and assigned to the Homer Roberts Telephone Company. With this system it is necessary to build up the line from the central to the calling station. This is accomplished through the agency of an impulse current. When a call is sent in over the continuous side of the line and the operator responds a single pull upon her "running" key will supply a sufficient number of impulses to build up the line to the calling station. Impulses to the called line are impressed manually, so that the particular station desired may be selected. There is a third key, a "passing" key, which serves when the desired station is on the same line as the caller. In this case when the nearest of the two stations is reached and has answered the "passing" key is operated and affords the means to lease this station on the line even though the line be built up farther out.

COMBINED WIRE AND WIRELESS SYSTEM.

Mr. M. B. Johnson, of San Antonio, Tex., has conceived the idea of so combining wire telephone circuits with wireless that a short gap may be overreached wirelessly where inaccessible for wires. For instance, a wire telephone circuit might be terminated upon the bank of a river or upon the brink of a chasm in a wireless telephone outfit.

A continuation of this line might begin upon the other side, this being similarly equipped with wireless apparatus. The inventor contemplates also the use of through-signal transmitting devices. Mr. Johnson has obtained two patents relating to this system and he has also applied the same idea to telegraphy.

AUTOMATIC SYSTEM.

An automatic exchange system is patented by Mr. W. H. Matthies, of Antwerp, Belgium, the patent being assigned to the Western Electric Company. The sending device is set up for all digits before the transmission of the call is begun. When the call is originated the calling line is picked up by a finder and then the selecting is initiated by starting the sender. The digit wheels return home one at a time in proper sequence and by so doing furnish the necessary impulses to operate the selector switches at the central and to perform the switching of the control circuit from one selector to the next, as well as to lock each selector in position as desired. The return of the receiver to the hook restores the finder switch, which in turn releases all selectors simultaneously.

REPEATER.

Two patents have been granted to Mr. E. F. W. Alexanderson, of Schenectady, for a telephone relay or repeater and for a repeating system. The system depends primarily upon a high-frequency alternator. This alternator is so arranged that the same winding serves for field and armature, there being a rotating inductor with many poles. The armature terminals are connected to condensers or otherwise tuned to resonance. The field currents are greatly reinforced by armature reactions under these conditions. Therefore, if a telephone current be used in the field coils a reinforced current will be generated by these reactions. This high-frequency reinforced current may be rectified by mercury-arc converters and thus a reinforced telephone wave of direct current produced. The patents for this system are assigned to the General Electric Company.

Letters to the Editor.

Nomenclature of Instrument Transformers.

To the Editor of Electrical World:

Sir:—Your comment appended to a letter appearing in the issue of July 22 relative to the names of instrument transformers appears to have aroused some controversy. Will you, therefore, permit me to speak a word in the interest of simplicity and directness in our nomenclature?

No one believes more firmly than I in accuracy of expression, but when accuracy resolves itself into academic purism I would say that it is time for us to find something brief and to the point in good old English. I am also a believer in giving specific names to specific things when the specific thing is of sufficient importance to deserve a name. In that case the name should be terse, and at the same time descriptive.

The instrument transformer is a highly specialized piece of apparatus designed for a specific purpose. It is distinctly different from anything else we have, and it is used in such large numbers as to require a distinctive name. When you speak of a "shunt transformer" you include not only the little switchboard instrument, but also thousands of other transformers used for an entirely different purpose. If we are to adopt this name we must add to it another word to show that we are speaking of a shunt *instrument* transformer and not of a shunt *power* transformer. Similarly, the term "series transformer" includes a variety of devices used for quite different purposes.

But why should we take so much trouble? A transformer is a thing that transforms. A "current transformer" is a thing that transforms current for the purpose of measuring current, and for no other purpose. If it also transforms voltage this fact is insignificant since the voltage is simply a by-product which is neglected. Similarly, a "voltage transformer" is a thing that transforms voltage (*not* potential) for the purpose of measuring voltage and for no other purpose. The names are terse, descriptive and non-ambiguous.

One is reminded of an incident which is said to have occurred when Adam and Eve were naming the animals. When they came to the toad Adam was sorely perplexed. But Eve solved the difficulty with masterly directness by saying: "Well, it looks like a toad, it hops like a toad, and it is not like anything else I have ever seen. Why not call it a toad?" Will you permit me to say in like manner—it looks like a current transformer, it works like a current transformer, and it is not like anything else in general use in the electric arts, so why not call it what it is—a *current transformer?* Also, in like manner, the *voltage transformer.*

New York. Frederick K. Vreeland.

To the Editor of Electrical World:

Sir:—Your dicta in the issue for July 22, 1911, page 231, in which you criticise the use of the terms "voltage" or "potential" and "current" with reference to instrument transformers, and virtually accuse those who use such terms of taking unwarranted liberties with the English language, would be more convincing if some really cogent reasons were given for the usage which you uphold. Your statement that "the qualifying words 'series' and 'shunt' describe properly the types of transformers used with instruments" is, to my mind, accurate only in so far as it applies to "series" transformers. To call a transformer a "shunt" transformer is by no means to designate its type in an unambiguous manner, unless a special convention is understood with reference to the usage. The term "shunt" was used originally in connection with a by-pass on a galvanometer, the by-pass taking a portion of the current which otherwise would go through the galvanometer. Starting from that significance, the term "shunt" has come to apply to a resistance connected in series with the line and having leads going to a current-measuring instrument. This is a very distinctly different thing from a resistance or reactance across a constant-potential line, which is the connection employed in voltage transformers.

I am quite aware that it is common usage, especially in England, to speak of the "shunt" windings of a wattmeter or a watt-hour meter, meaning thereby the windings which take a current proportional to the voltage on the constant-potential line. A similar usage prevails with respect to arc-lamp voltage windings. It seems to me that in view of the historical and actual use of the term "shunt" this usage is not justifiable and that for the same reason to speak of a "shunt" transformer is not good usage. If the "shunt" transformer is a shunt on anything it is a shunt on all of the other receiving apparatus on the constant-potential line. From this point of view the term has no significance whatever. Common usage in speaking of a shunt-wound dynamo or motor may be cited in defense. However, this is not a parallel case since in the generator or the motor the field actually does constitute a shunt on the armature and the armature is connected across the line. With respect to watt-hour meters the misuse of the term "shunt" is particularly apparent and may lead to decided confusion. Take the case of a meter in which an actual shunt is used to carry part of the current so that all of it does not go through the current windings of the meter. If this meter has a voltage winding also, which is the "shunt" winding? This is by no means an impossible case.

To sum it up, it seems to me that to speak of a "shunt" transformer or of the "shunt" winding of a meter is bad because inaccurate and confusing. The series transformer

performs the ordinary functions of an instrument shunt, and to call the voltage transformer a "shunt" transformer at once complicates the matter greatly.

To the use of the word "series" in connection with transformers I have no objection *per se*, but, as has been pointed out, if we speak of voltage transformers we must also speak of current transformers. Since we cannot without confusion speak of "shunt" transformers, we cannot use the corresponding term "series" transformers; or if we must employ the term "series" transformers, which is unobjectionable, we should use as the counterpart of that the term "multiple" transformer rather than the term "shunt" transformer, and this usage is favored by no one.

As between "potential" and "voltage" as applied to transformers undoubtedly the term "voltage" transformer is to be preferred. A transformer does not transform potential in any sense of the word—it does transform the voltage of the circuit.

New York. CLAYTON H. SHARP.

[The argument against the use of the word "shunt" in connection with an instrument transformer, in that the term does not distinguish between transformers used with voltage-measuring instruments and those employed for carrying heavy loads, could be used equally well against the term "voltage transformer" or "potential transformer," but without convincing those who mentally insert the word "instrument" with "voltage transformer" or "potential transformer," but not with "shunt transformer." Usage can hardly be accepted as a criterion of accuracy, although it frequently determines the choice when accuracy is not involved or considered. The attention of those who place predominating importance on usage should be called to the well-established term "constant-potential transformer," which would seem to be just as accurate or inaccurate as the term "potential transformer," which may or may not be synonymous with the term "voltage transformer," but is frequently used as its equivalent in designating a "shunt-instrument transformer." This latter term appears to be the proper complete one to use, but in cases where the word "instrument" will naturally be inserted mentally by the reader this word can well be omitted in writing.—ED.]

Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

Generators, Motors and Transformers.

Three-Phase Series Motor.—F. W. SCHMIDT.—A discussion of the principles of the three-phase series commutator motor and its speed-regulation methods, with a development of its characteristic diagram.—*Elek. u. Masch.* (Vienna), May 7.

Two-Phase to Three-Phase Transformation.—M. VIDMAR.—An illustrated description of a new method of transforming a three-phase into a two-phase system, for which certain advantages over the well-known T-method are claimed. Use is made of a single transformer with three legs, as shown in Fig. 1. The two outer legs have equal cross-section, the middle leg has a cross-section $\sqrt{2}$ times that of each of the outers. The primary (three-phase)

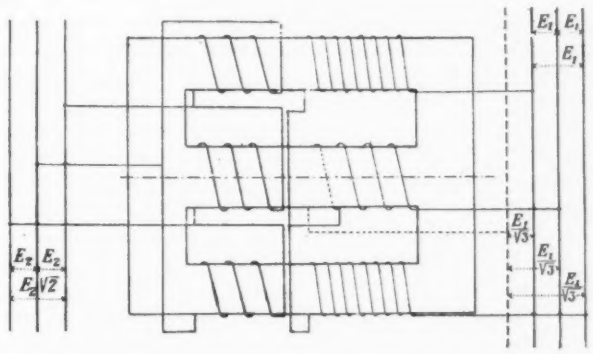


Fig. 1—Two-Phase to Three-Phase Transformer.

windings on the two outer legs have the same numbers of turns, while the ratio of the number of primary turns on the middle leg to the number of primary turns on each of the outer legs is 0.366. The three secondary windings (on the two-phase side) have equal numbers of turns. Any symmetrical non-inductive or inductive load is transferred as symmetrical load from one side of the transformer to the other side. This is the case for the new method of transformation as well as for the T-connection. But an advantage is claimed for the new method over the T-connection in so far as the stray fluxes in the latter are considerable. If from the transformer when supplied with three-phase currents on the primary side two-phase currents are to be taken off from the secondary side in such a way that each of the two phases is distributed independently of the other, each by means of two wires (for instance, in order to lead two arc-lamp lines in different connections), use is made of the arrangement of Fig. 2, in which an auxiliary circuit (indicated by the dark line) is employed. Further advantages claimed for the new arrangement are the smaller space requirement and in many cases also a smaller requirement of active material.—*Elek. u. Masch.* (Vienna), June 11.

Lamps and Lighting.

Alternating-Current Arc Lamp.—A note on a recent British patent (No. 6336, June 8, 1911) of Korting & Mathiesen Akt.-Ges. It is known that an alternating-current arc sometimes acts as a converter to direct current,

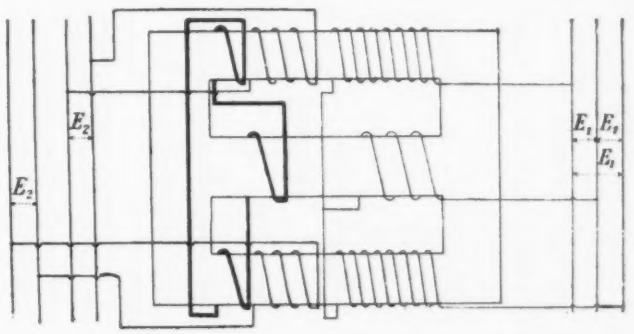


Fig. 2—Two-Phase to Three-Phase Transformer.

which affects the magnetic system in the case of lamps fed mechanically by an armature and a solenoid and renders the control of the lamp difficult. This is remedied by connecting the solenoid to the secondary of a small transformer, the primary being connected across the lamp. The advantage of using the transformer is that the secondary pressure can be selected as required, and the solenoid winding need not be calculated in regard to the lamp pressure, but can be identical for various types of alternating-current arc lamps. —Lond. *Elec. Eng'ing*, June 15.

Street Lighting.—L. CROUCH.—The concluding instalments of the author's illustrated serial on electric street lighting, presenting a general review of the subject, includ-

ing various standard data commonly required. In these instalments are discussed the characteristics of metallic-filament and carbon-filament lamps; the illumination required in street lighting; the candle-power of various units; the areas lighted by various lamps; the power consumption per ft.-candle per square foot; the use of globes and lanterns; poles and fittings, and annual costs of various systems of street lighting.—Lond. *Elec. Review,* June 16 and 23.

Globes, Shades and Reflectors.—C. Toone.—An illustrated serial on the characteristics of globes, shades and reflectors. The features discussed are the brightness of luminous sources, the desirable illumination in various services, coefficients of direct and diffuse reflection, globe material, effect of dirt upon the absorption coefficients, subsidiary means of securing diffusion. In the accompanying tables are shown the percentage of light absorption by various clean materials and the per cent of loss of illumination due to dirt.—Lond. *Elec. Review,* June 16, 23 and 30.

TABLE I.—PERCENTAGE ABSORPTION BY CLEAN MATERIALS.

Material.	Average Absorption.
Clear glass	10
Clear arc globe	30
Clear arc globe	45
Prismatic glass	15
Light alabaster	20
Heavy alabaster	35
Light sand blasted	20
Ground glass	25
Frosted	11
Opal (dense)	30—50
Opal (dense)	55
Milky glass	35
Opaline	35
Translucent	20—40
Clear-stained Glass:—	
Canary yellow	20
Deep green	90
Deep ruby	90
Deep cobalt blue	95

TABLE II.—PER CENT ABSORPTION DUE TO DIRT.

Particulars of Case.	Per cent loss of Illumination Due to Dirt.
"Alabaster" glass globe (Nernst) mean	6 } per 100 hrs.
"Alabaster" glass globe (Nernst) maximum	12 } service
Acid-frosted glass bulbs	6 per 600 hours
Acid-frosted glass bulbs	10 per 2 months
Prismatic glass shade	13 per 1 year
Nernst lamp globe (various)	5 to 10 or 15
Filament lamp and globe, dirty	14 }
Globe alone, dirty	9 }
Arc lamp globe (opal) (bad case)	20
Prismatic reflector (for glow lamp), dirty	35 per 6 weeks
Prismatic reflector (for glow lamp), after dusting	20
Enameled metal reflector (over machine tool) finger-marked	20
Enameled metal reflector (over machine tool), finger-marked, old reflector, oil spattered	45
Enameled metal reflector (over machine tool), finger-marked over drilling machine, old, dirty	70
Desirable maximum deterioration, due to dust and dirt, between cleanings	5 to 10 per 30 to 60 days

Calculating Illumination.—L. S. Twomey.—A paper presented before the San Francisco Section of the A. I. E. E. giving outlines of the established methods for calculating illumination, including the Rousseau diagram, the Kennelly diagram, the fluxolite diagram and the point-by-point method.—*Jour. Elect., Power and Gas,* July 1.

Generation, Transmission and Distribution.

Convention of Municipal Electrical Association.—The sixteenth annual convention of the (British) Incorporated Municipal Electrical Association was opened at Brighton on June 27. In his presidential address Mr. J. Christie stated that the membership consists of 168 municipal, 187 engineer, forty-eight associate and four honorary members, and the capital invested in the machinery and plant under the control of the members is about $205,000,000. Councilor Leese, chairman of the Stoke-on-Trent electricity committee, presented a paper entitled "Electricity Supply Viewed from the Municipal Committee's Standpoint," in which he discussed a few of the points with which an electricity committee has to deal, including extension, size of plant, profits, cost of supply, showrooms and tenders. "Modern Wiring Practice" was the title of a paper by Mr. J. W. Beauchamp, chief electrical engineer. Tunbridge Wells, in which it was suggested that the wiring regulations should be as simple and light as possible, but their enforcement should be stringent. After analyzing the various existing regulations and pointing out the desirable features, the author discussed cheaper wiring methods and tabulated the costs of various systems. Diesel oil engines were discussed in a paper by Mr. H. L. Howard, chief electrical engineer, Barking. After outlining the features of the engines the author considered the question of oil supply and the cost of operation, the items of fuel, labor, repairs and maintenance being treated separately. Taking the existing installation at Brighton as an example of a steam-driven station, the first costs of corresponding stations equipped with Diesel plant and gas plant were given. The Diesel installation showed to advantage in this case, as well as in a number of figures given for Continental installations. The use of Diesel engines in substations was recommended, and the author predicted striking developments in the next few years. Gas engines and producer plants were dealt with in a paper by Mr. R. M. Carr, chief electrical engineer, Leek. The author gave a number of figures as to the first cost of steam-driven and gas-engine stations. These show that below 1000 kw the gas-engine station costs less than the steam plant. After giving particulars of the Leek electricity supply station he next compared the works costs of gas and steam stations under 1000-kw rating. A statement of the capital and running costs of a gas-driven station of 1000-kw rating is given. Discussion on the topics "The Purchase of Fuel" and "Street and Store-Front Lighting" were opened respectively by Mr. C. E. C. Shawfield, Wolverhampton, and Mr. A. H. Seabrook, St Marylebone.—Lond. *Electrician,* June 30.

Continuity of Electric Service.—R. P. Jackson.—The ninth and concluding article of a series on the general subject of continuity of service in transmission systems. In the present instalment are discussed the elements contributory to interruption of service, including external causes, internal causes and inability of operating force. The author remarked that there is no panacea for the troubles of transmission systems, nor can any equipment or installation be worked out so completely as to eliminate accident or the "personal equation." The best designed and best conducted systems will meet with accidents at times, but on the whole, if proper care is taken and the best skill employed in making up the material equipment, and if eternal vigilance and preparedness are insisted upon, the return will be in the form of increasingly reliable service.—*Elec. Jour.,* July.

Fuel Economy.—C. E. C. Shawfield.—Emphasis is placed on the importance of determining by calculation what the specific consumption of any chosen station should be and then carrying out tests to insure the consumption approaching this figure. Notes are given on the operation of the engine-room equipment, more particularly steam turbines, and the operation of the boiler equipment. The author recommends a bonus scheme for the boiler-house staff, based on the evaporation of water per pound of fuel. —Lond. *Electrician,* June 23.

Traction.

Mercury-Contact Treadle for Railway Signals.—An illustrated description of the Siemens mercury-contact treadle arranged automatically to close or open an electrical circuit by the passage of a train at a given point on a railway line. The treadle is supported solely from one rail between two adjacent ties and is actuated by the deflection of the rail between the two ties due to a passing wheel, the slight movement obtained being transferred to the elec-

trical contacts, as indicated in the cross-sectional view of Fig. 3. The treadle is in the form of a strong iron casting *A* which, by means of the clamps *B B*, is firmly bolted to the bottom flange of the rail. In the center is a circular shallow recess *C*. A thin steel diaphragm *D* is clamped between the rim of the recess and the cover *E* by the bolts. In the center of the cover *E* are the steel plunger *F* and plate *G* resting on the diaphragm *D*. An india-rubber ring *H* laid in a groove in the cover *E* surrounding the plunger *F* makes an elastic contact joint which is both waterproof and

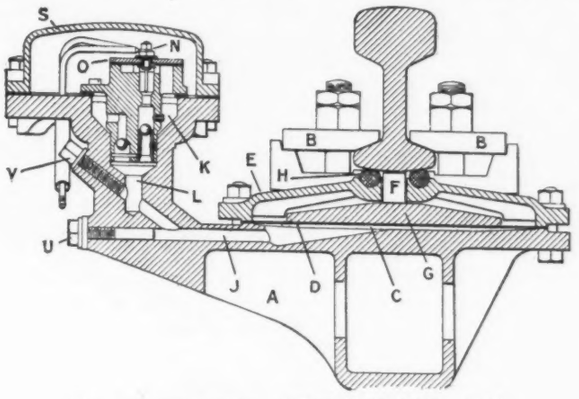


Fig. 3—Cross-Section of Treadle Bolted to Rail.

dustproof between the treadle and the under surface of the rail. The passages *J* and *L* connect the recess *C* with the contact device inserted into the mercury chamber *K*. The contact pins *N* are supported by, but insulated from, the cover *O* of the contact box. The contact device consists of a cast-iron box having valves and passages, the action being similar to that of a pump. According to the type of contact for which the device is arranged mercury is either forced into or withdrawn from the contact box. When the rail experiences a slight deflection between the points of attachment of the treadle, due to the weight of a moving vehicle, the plunger *F* communicates the deflections, however slight, to the diaphragm *D* and thus displaces the mercury confined in the recess below. The ratio between the area of the recess and that of the contact chamber is about 1500 to 1, so that sufficient mercury is displaced to insure the making of a good electrical contact.—Lond. *Electrician*, July 7.

Detroit River Tunnel Electrification.—W. M. RENNIE.—A descriptive article giving details of the electrical equipment of the Detroit River tunnel between Detroit, Mich., and Windsor, Ontario. Steam trains are drawn through the 12,783-ft. tunnel by 1200-hp direct-current locomotives receiving energy from a three-phase, 4400-volt transmission system through synchronous motor-generator sets.—*Michigan Technic*, June.

Installations, Systems and Appliances.

Switch Handles.—S. LEES.—A note calling attention to the lack of protection afforded by the handles of knife switches and starting rheostats, the badly proportioned handles being termed of an "apologetic character."—Lond. *Elec. Review*, June 30.

Exhibition of Domestic Uses of Electricity.—C. PAULUS.—At this year's annual convention of the German Association (Verband) of Electrical Engineers, in Munich, there will be a symposium of papers on domestic uses of electricity. In connection with this a quite extensive exhibition has been arranged illustrating the domestic uses of electricity and its uses in small shops and in agriculture.—*Elek. Zeit.*, June.

Minimizing No-Load Transformer Losses.—A note on a British patent (No. 12,926, June 22, 1911) of Mr. G. Berry relating to the inventor's series transformer method for minimizing the no-load losses of a constant-potential transformer. The patent covers a scheme for preventing the switch mechanism, after acting automatically to short-circuit the supplementary transformer upon failure of the main transformer during low load, from being afterward automatically moved into a position to open the short-circuit when the relay reassumes the position corresponding to low load. For this purpose, one winding of the main operating solenoid is arranged to be closed by a relay through a circuit that will be rendered non-effective upon failure of the main transformer, by being arranged to be closed across the secondary of the main transformer between the ends thereof and the fuses in the conductors connecting such ends to the secondary mains. The other winding is connected across the low-tension circuit, and the fuses for the primary and secondary of the main transformer are weaker than those of the spare transformer.—Lond. *Elec. Eng'ing*, June 29.

Wires, Wiring and Conduits.

Wiring in Earthquake Countries.—RUFFOLO.—During the earthquake in Sicily in 1908 the author found that overhead electric wires aided the destruction of buildings. He recommends to arrange the ends of the wire, where they are connected with an insulator, in spiral form and to fix the spiral to the insulator by means of an auxiliary

Fig. 4—Auxiliary Support for Transmission-Line Wire.

stretched steel wire, as shown in Fig. 4. In case of a sudden strain due to an earthquake, the auxiliary steel wire breaks and the spiral of the copper conductor can extend freely so that it will not cause a destruction of the building.—*Assoc. Elettrot. Italiana*, No. 2, 1911; abstracted in *Elek. u. Masch.* (Vienna), April 16.

Suspension Insulators.—A note on a British patent (No. 27,174, June 22, 1911) of the Société Vendonelli, Priestley & Cie., covering a chain for the suspension of high-tension insulators, in which each porcelain insulator has a core perforated by two holes at right angles to each other and has downwardly sloping wings. The insulators are connected by rings of iron wires, so that the wings of one insulator react between those of the next below, giving protection against rain and minimizing leakage.—Lond. *Elec. Eng'ing*, June 29.

Electrophysics and Magnetism.

Electric Transients.—C. P. STEINMETZ.—An article devoid of theoretical mathematics dealing with the origin, general characteristics and numerical relations of transient phenomena in electrical transmission systems. The author explains, first, the storage of energy in magnetic and dielectric fields and shows that in high-potential systems the dielectric energy may equal or exceed the normal magnetic energy. When the two energies are of the same magnitude dangerous electrical transients may be produced by a surge of the stored energy between its two forms. The "natural impedance of the circuit" is defined by the writer as the relation between the maximum value of the oscillating current and the maximum value of the oscillating voltage. The natural impedance is numerically equal to the square root of the ratio of the line inductance to the line capacity and is usually between 200 ohms and 600 ohms in transmission lines. An example of the application of this relation is given in the calculation of the maximum current that a lightning discharge can produce in a line the insulation of which will withstand a maximum of 150,000 volts. With a natural impedance of 400 ohms the maximum discharge current is 375 amp, which the lightning arresters must allow to pass without damage. Similarly if a load current of, say, 283 amp is suddenly interrupted the maximum oscillating emf would be $283 \times 400 = 113{,}200$ volts. In case of a short-circuit current five times as large the oscillating emf would reach 566,000 volts, which is far beyond the possible insulation strength of the line.—*Jour. Franklin Inst.*, July.

Electrochemistry and Batteries.

Two-Phase Arc-Type Furnace.—An illustrated description of a 3-ton steel-smelting electric furnace of the arc type using two-phase current. The two terminal electrodes enter through the roof, while the neutral return is a carbon electrode embedded in the bottom. The arcs form from the top electrodes on to the slag and metal, the current passing through the metal and the refractory lining of magnesite or dolomite to the neutral electrode. It is stated that, unlike either a single-phase or a three-phase arrangement, the two-phase scheme results in both horizontal and vertical movements in the bath, thereby minimizing the local heating and the energy consumed.—Lond. *Elec. Review*, July 7.

Units, Measurements and Instruments.

Tension and Sag of Overhead Wires.—A. Mueller.—An article, illustrated by numerous diagrams, on the determination by a graphical method of the tension and sag of overhead wires, with special consideration of the influence of temperature variations and of additional loads due to snow, ice or wind. The principle of the method is described and a numerical example is given.—*Elek. u. Masch.* (Vienna), April 30 and May 7.

Measuring Apparatus.—T. Bruger.—An illustrated paper read before the Frankfort Electrical Society on several new measuring instruments of Hartmann and Braun. They are a bridge with sliding contact for measuring insulating resistances from 100,000 ohms down to a few hundred ohms, a bridge for comparison of potentials and of coefficients of self-induction, and a testing apparatus for lightning rods which permits one to read directly the resistance to earth without any calculations.—*Elek. Zeit.*, May 25.

Resonance Curves.—F. Kock.—The author shows that the use of a rotating Geissler tube is a simple means for determining resonance curves with damped and undamped oscillations. With a sufficiently large Geissler tube the phenomena in oscillating circuits can be demonstrated in a lecture-room.—*Phys. Zeit.*, May 15.

Telegraphy, Telephony and Signals.

Energy Losses in Telephoning.—F. Breisig.—The first part of an account of extended experiments in which the different losses in telephone apparatus were determined. For the tests a permanent alternating current of a frequency of 800 cycles per second was used. The telephone was used in such a way as it is employed in practice, namely, the receiver being taken off during speaking. The connections of the central battery system were used. It was found that during receiving out of the total electrical energy received 70.5 per cent was lost in the microphone, 1.6 per cent in the bell, 18.4 was supplied to the telephone, the loss in the primary winding was 3.4, that in the secondary winding was 3.4 and the losses in the other coils 2.7. The chief source of loss is in the microphone, and, since it is entirely unnecessary while speaking, it might be short-circuited at that time, but this would cause trouble on account of its high resistance. To avoid this trouble and to reduce the alternating-current impedance a condenser of 2 mf was connected in parallel with the microphone when receiving. When speaking it was disconnected by means of a simple switch. With this arrangement the above figures of losses were greatly changed. The loss in the microphone was now only 12.1 per cent, the loss in the bell 1.1, while 57.2 per cent of this was delivered to the telephone and 29.6 was lost in the coil. The influence of the microphone may also be reduced successfully by using a higher number of turns for the primary coil. The author then passes over to a discussion of the telephone as transmitter. The article is to be concluded.—*Elek. Zeit.*, June 8.

Miscellaneous.

Engineering Education.—Report of a conference organized by the (British) Institution of Civil Engineers on the subject of the education, and training of engineers. The conference was divided into sections dealing with general education, scientific training and practical training. In his opening remarks President Alexander Siemens, of the Institution of Civil Engineers, said that a young engineer should be educated so as to become a dividend earner for his employer, for this is the most reliable indication of his merit, and the corresponding reward will not be wanting. For the same reason he should possess some knowledge of business methods and of law, not with a view of becoming his own lawyer, but in order to be able to judge when legal advice is needed. Sir William White expressed the hope that the conference would endeavor to find the golden mean between too great theory and too great practice in the education of engineers. Sir John Wolfe-Barry remarked that an engineer should be given the general education of an accomplished gentleman with a theoretical and practical knowledge of his profession. At a joint meeting of the general education and scientific-training sections Chairman A. G. Lyster said that education to be of real value should not only furnish information and knowledge, but should also train and expand the intelligence and develop that type of character which fits a man to lead the best and most useful life. In a paper entitled "Literary Education and Engineering" Rev. James Gow claimed that most of the mischief that is done in life is done in leisure, and the rational enjoyment of this time is the real object of general education. The best plan is to give a boy a general education, mainly literary, until he reaches the age of sixteen and then to watch him closely and allow him to continue his studies along the lines best suited for him. Prof. S. P. Thompson read a paper discussing the extent to which mathematical and scientific subjects should share with other subjects of literary education the attention of schoolboys who intend to enter later the engineering profession. The author said that the fossilization of science-teaching is the thing now most to be feared. The object of science-teaching at school should be not to impart the facts or data of science, still less to systematize their rediscovery, but to evoke interest. Professor Thompson said that any specialization in science subjects before passing the stage of matriculation is essentially out of place and harmful. The distaste for mathematics on the part of the students is attributable more to bad teaching than anything else. When mathematical teaching is dull the fault is with the teacher. He said that nowadays boys are less capable of following a sustained train of thought than they used to be. Of vastly more importance in the ultimate making of a professional engineer than the acquisition of a hoard of scientific facts are cultivated precision in the use of words and cogency in modes of thought. Prof. A. Schwartz read a paper on the question of specialized entrance examinations for university or college courses of study in engineering science, with a view to the curricula to be followed and also the inclusion in the latter of courses in modern languages. The author expressed the opinion that the matriculation examination of a university should be essentially a test of general education and should draw upon all mental faculties. In a paper on the apportionment of training between practical work and scientific study, with some suggestions applying to apprentices in or on works far distant from their homes, Mr. A. F. Yarrow claimed that colleges should endeavor to arrange their engineering courses of study so as to allow the students to spend six summer months in the shops at practical work and six winter months in the college at theoretical study. The requirements of practical training in works, with the necessary complement of scientific study, were treated in a paper by Mr. W. H. Allen. Two papers on the practical training in workshops or on works of construction, with special reference to training in the engineer's office, were presented by Messrs. W. B. Worthington and H. F. Donaldson. Among other subjects discussed were the relation of engineering employers and colleges from the point of view of the practical training of engineers and the relation of practical training to college study.

The value of a university degree in engineering science in relation to professional competence was the subject of two papers by Profs. S. M. Dixon and C. F. Jenkin. Three papers on the position and uses of engineering laboratories in relation to education at college were read by Profs. W. E. Dalby, John Goodman and Bertram Hopkinson. The relation of engineering employers and colleges from the point of view of the practical training of college students was discussed in two papers by Prof. J. E. Petaval and Mr. J. W. Horne. The relation between practical training and college study was treated by Profs. Archibald Barr and Henry Louis. Workshop training as a preliminary to practical training in other branches of engineering was the subject of three papers by Messrs. J. A. Brodie, J. M. Moncrieff and J. W. Welch.—Lond. *Engineering*, June 30 and July 7.

Fire Alarms.—VON MOLTKE and ANHAGAN.—An article on electric fire-alarm systems, on the use of the loud-speaking telephone for such purposes, and on the use of electric automobiles for the engines, etc.—*Elek. Zeit.*, June 1.

BOOK REVIEWS.

ELEKTRISCHE BELEUCHTUNG. By Dr. Berthold Monasch. Second and enlarged edition. Hanover: Dr. Max Jänecke. 331 pages, 112 illus. Price, 9.20 marks.

In this, the second, edition there has been added to the contents of the first edition an extension of 102 pages, bringing the contents of the book up to date and thus putting virtually two volumes into one binding. The second volume relates to advances in the art of electric lighting during the last five years.

Reference is made to the new international candle, which is admitted to simplify international photometry, although the value assigned thereto is 0.9009 hefner instead of the 0.9 valuation taken by the three contracting countries. Three units of luminous intensity are considered as remaining in official existence; namely, the hefner, the international candle and the carcel. In regard to illumination five units are claimed to exist; namely, the meter-hefner, the ft.-hefner the international ft.-candle, the international meter-candle and the meter-carcel. Two of these claim to be called the lux.

The book is a good compendium of electric lamps and lighting under up-to-date middle European conditions.

LIGNES ÉLECTRIQUES. Vol. I, Lignes Électriques Aériennes, by Ph. Girardet. Vol. II, Lignes Électriques Souterraines, by Ph. Girardet and W. Dubi. Paris: Gauthier-Villars. 181 pages, 13 illus.; 208 pages, 48 illus. Price, 5 francs.

Two thoroughly practical and carefully written volumes on the purchase, installation, equipment and repair of overhead and underground lines, especially for electric power distribution. The volume on overhead lines is particularly instructive as giving many details concerning the construction and erection of wooden, iron and reinforced-concrete poles. The books will be useful to constructing electric light and power engineers interested in recent French practice.

LECONS SUR L'ÉLECTRICITE. By Eric Gerard. Paris: Gauthier-Villars. Vol. I, 975 pages, 458 illus. Vol. II, 989 pages, 489 illus. Price, 24 francs.

The eighth edition of an excellent textbook intended primarily for the students of the Montefiore Electrotechnic Institute, enlarged and brought up to date. One is struck in reading these volumes by the large field which they so effectively and conscientiously embrace. It is almost impossible to find an electrical engineer of the last decade's training who attempts to cover so wide a field. Vol. I deals with the theory of electricity and magnetism and with the theory and design of electric generators. It takes up dynamo design in considerable detail. Vol. II deals with transformers, the distribution of power, telegraphy, telephony, power transmission, traction, electrometallurgy and industrial chemistry. The treatment is very clear, the diagrams good. The book is best from the viewpoint of the teacher, but will be of interest to advanced students of electrotechnics who wish to be familiar with principles and design as taught in Belgium.

New Apparatus and Appliances

DEMAND FOR ELECTRIC SHOVELS.

In the course of a recent talk before the Electric Club of Chicago Mr. George Patnoe, who is general superintendent of the Dolese & Shepard Company, of Chicago, made some interesting observations on steam versus electric shovels. Mr. Patnoe is a practical quarryman of wide experience and is in charge of the Gary (Ill.) plant of his company, which is no doubt the largest electrically equipped quarrying and stone-crushing plant in the country. He said that the use of electric shovels is desirable in such plants, but he regretted to say that those designed for his company's use at Gary were a failure, being too slow in operation for practical requirements. They possessed only 60 per cent of the speed of steam shovels.

Mr. Patnoe thinks that the trouble in designing electric shovels has been that the electrical man does not know enough about shovel mechanism and the shovel man does not know enough about electrical equipment. However, there is a real demand for an electric shovel, as many troubles are experienced with steam shovels. Mr. Patnoe thinks that a successful electric shovel can be made and eventually will be made. It would seem to be desirable to have the motor run continuously and to apply the power as needed by some system of gearing. If a practical electric shovel can be designed its cost of operation will be less than that of the steam shovel, and it will have a number of advantages in quarry operation, where, in general, electrical distribution of power is greatly to be preferred to the transmission of steam or the operation of a number of scattered boiler plants.

HANDLING FREIGHT BY ELECTRICITY AT ST. LOUIS, MO.

The Missouri, Kansas & Texas Railway Company has recently completed its new freight terminal at St. Louis, which is equipped with what is probably the most extensive motor-driven telpherage system ever installed, having a capacity to handle more than 1,000,000 lb. of freight in "less-than-carload" lots in five hours.

The building is a two-story steel structure, 232 ft. x 400 ft. in plan, and its first floor is occupied by sixteen tracks aggregating nearly a mile in length and capable of holding

117 cars. The second story is taken up with the receipt, delivery and storage of freight matter. From its ceiling the elaborate system of telpherage runways is suspended, and through hatches in the second-story floor the island platforms of the track level below are reached.

At least 75 per cent of the freight passing through the St. Louis terminal is outbound, destined for the great Southwestern country, of which St. Louis is the gateway. The problem of handling the virtual deluge of "less-than-carload-lot" (or, in railroad vernacular, "L C L") freight which pours through this distributing point demanded the most modern and dependable conveying equipment, and after careful study by the engineers in charge the problem has been solved by the application of motor-driven telphers, jib cranes and gantries, using central-station service.

Taking advantage of the slope in the ground at the terminal, wagons loaded with freight for shipment drive directly from the street to the second-story level of the building. Within boom radius of these driveways are seventeen jib cranes on the columns of the building, and by means of these cranes merchandise from the wagons is deposited directly onto flatboards or scales, where it is weighed for determination of charges. After being weighed the loaded flatboards, each of 2 tons capacity, are picked up by the telphers and carried to the hatches corresponding to the platform entering the cars. An automatic trip releases the telpher cable as soon as it becomes slack after having deposited its load on the platform. This obviates the services of a ground man and releases the telpher car for other duties as soon as its mission in any hatchway is accomplished. The car then proceeds to the main runway and finds an unoccupied branch, in this way keeping all runs automatically refilled as fast as emptied. After being deposited on the island platforms between tracks the trucks can be trundled into the cars. The platforms are 11¼ ft. wide, sufficient to allow two trucks to pass.

The telpher runways, twelve in number, suspended from the second-story ceiling, are placed at right angles to the line of the track. Ten of these runways serve the island platforms, while the two extra runs are used for car storage and are equipped with pits for making repairs when necessary. The runways are built up of 24-in. I-beams, on the lower web of which light T-rails are mounted on wooden blocks, which serve to deaden the sound. The two trolley wires supplying the 230-volt direct current, with underground return, are carried on insulators supported from the I-beam structure.

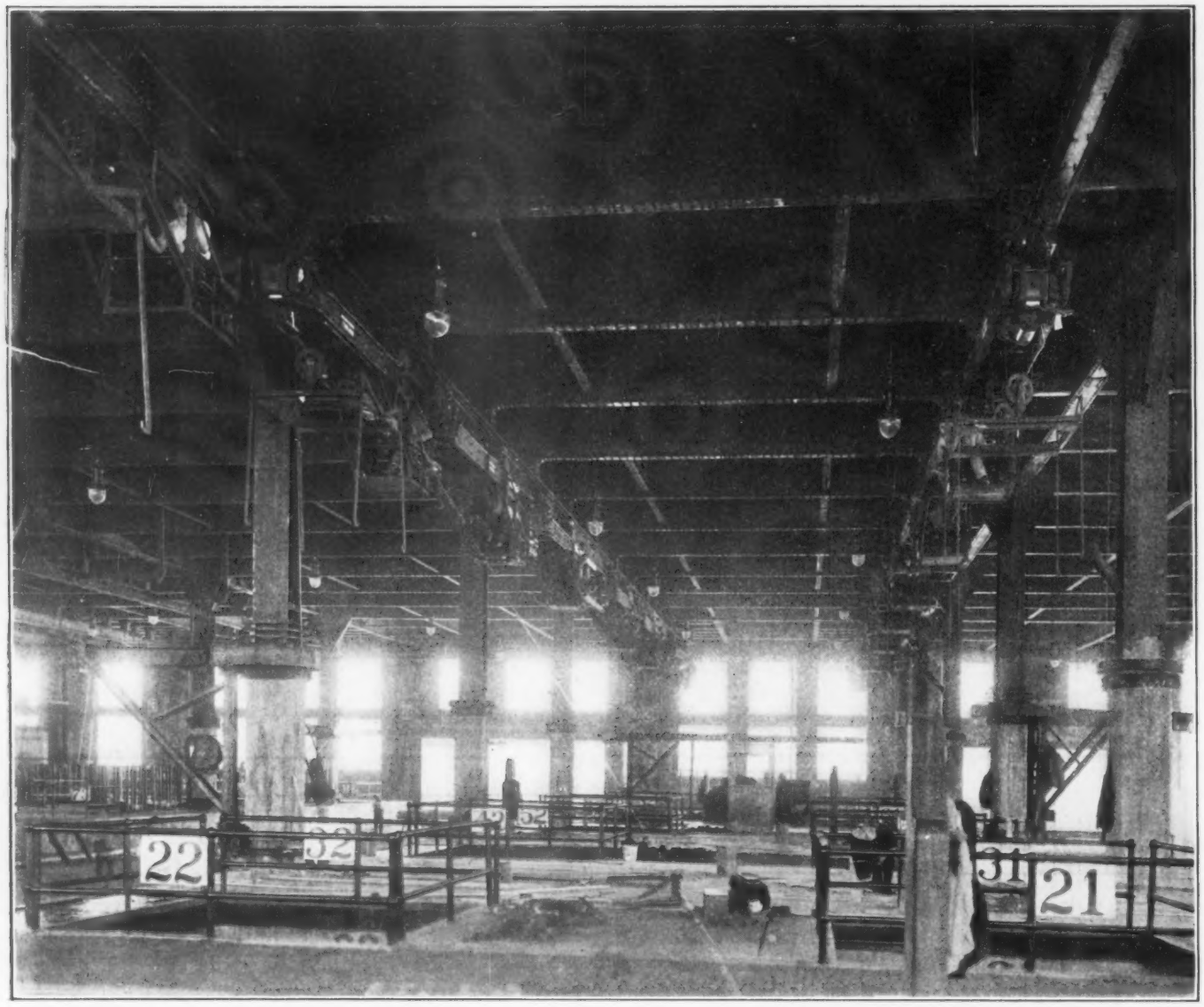


Fig. 1—General View of the Motor-Driven Freight-Handling Installation.

Eighteen telpher cars are now in use. Two of these have a capacity for handling 6 tons each, while the remainder are of 2-ton rating. The larger machines are equipped with 15-hp series direct-current motors for the travel motion and 25-hp hoist motors. They are operated along the overhead rails at a track speed of 500 ft. per minute. The hoist mechanism is adapted to raise its rated load at 60 ft. per

minute, but can lower at 120 ft. per minute. The two motors of each car are equipped with rheostatic control, manipulated by the operator in the cab.

Direct-current energy at 230 volts for the telpher contact trolleys is furnished by a duplicate pair of 100-kw, three-wire, 230-115-volt motor-generator sets, the motor elements of which are 4000-volt, 60-cycle synchronous ma-

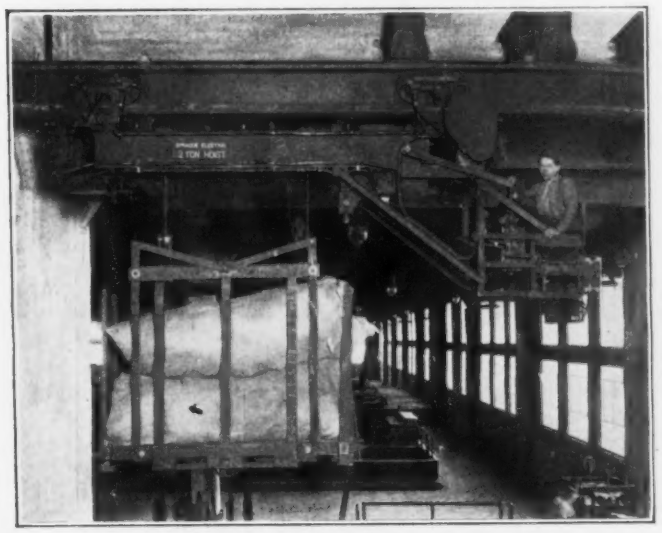


Fig. 2—Motor-Driven Telpher.

chines, operated from the transmission lines of the Union Electric Light & Power Company of St. Louis, which supplies all electrical energy for lighting and motor purposes in the freight terminal. The motor-generator sets, together with the eight-panel controlling switchboard, are installed in the southwest corner of the basement of the building. The Union Electric Company furnishes its own main-line oil switch, primary meters and instrument transformers.

The terminal building is lighted by 126 multiple, 115-volt arc lamps controlled from a panelboard which is equipped with an annunciator and signal circuits from twenty-six push-button stations on the main floor and in the basement of the building. In case an employee requires light for some purpose on one of these floors he pushes a nearby button, which sets up an indication on the annunciator as a

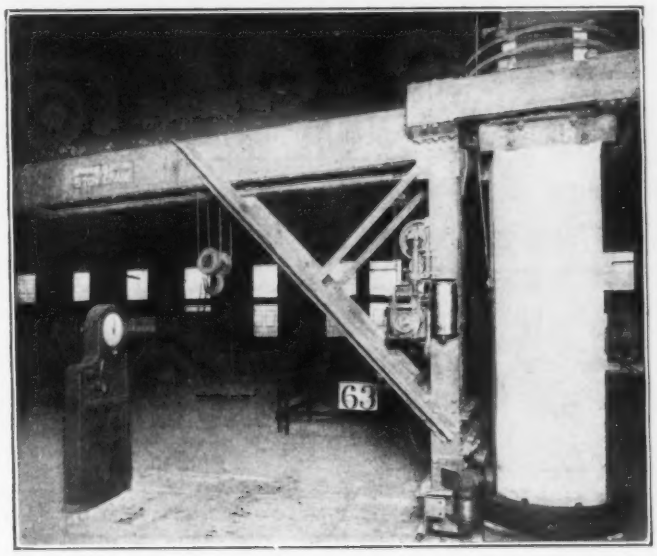


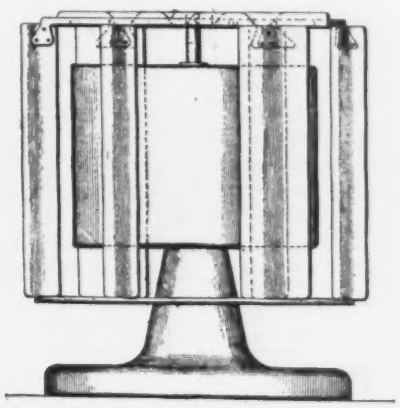
Fig. 3—Motor-Driven Crane.

signal to the attendant to turn on the corresponding lamp circuit at the switchboard.

The telpherage equipment was furnished by the Sprague Electric Works, General Electric Company, New York. The entire freight-handling installation was designed and installed under the direction of Mr. S. B. Fisher, chief engineer of the Missouri, Kansas & Texas Railroad, and Mr. A. T. Vick, electrical engineer.

VERTICALLY MOUNTED FAN.

The vertically mounted circulating fan herewith illustrated is especially constructed for use upon the hotel, restaurant or household dining table. The fan in width or horizontal diameter is only 7 in. and its height over all is

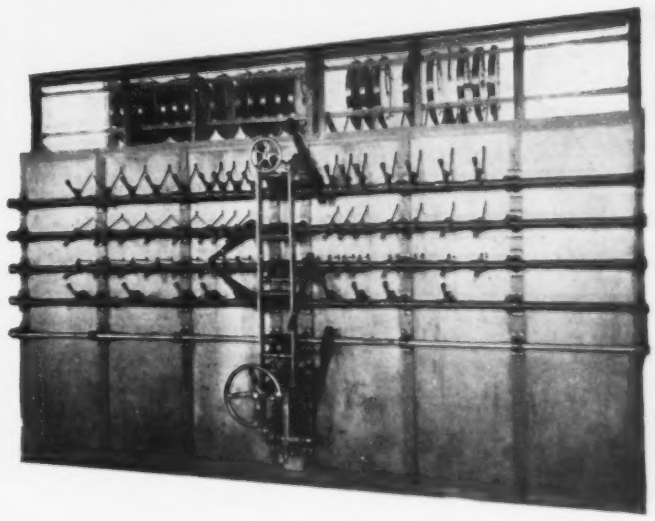


Vertical Shaft Fan.

less than 9 in. The entire blading and rotating parts are protected by a well finished bell-shaped wire meshing which envelopes the entire fan and is fastened to the base of the motor. The disposition of the blading is such that each person at a dining or library table receives the breeze in the face, and the usual discomfort of having the air thrown on the top or side of the head in full force, while a table companion may be receiving little or no benefit, is obviated. The fan illustrated is made by Mr. Hartwell Jalonick, El Paso, Tex.

THEATER DIMMERS FOR RUSSIA.

The Cutler-Hammer Manufacturing Company, of Milwaukee, has just shipped from its factory a large dimmer bank for a theater in St. Petersburg, Russia. This equip-



Theater Dimmers.

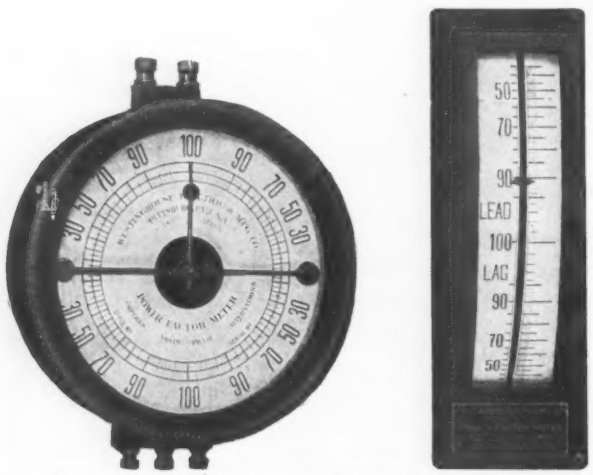
ment has several unique features. It is built so that it can be shipped in standard cars, the dimmers being mounted in unit banks and both front and rear frames being made so that they can be taken apart and easily reassembled. The framework consists of J-beams and channels fastened with

reamed bolts. It is usual to mount all parts on a wooden templet and install the marble switchboard at the theater. In this case a marble switchboard will not be used, but paneled sheet steel instead. These panels, which were mounted at the factory, will stand the long journey and will not warp.

The apparatus is designed to have an ultimate equipment of 140 dimmers, but for the present fifty-four dimmers were furnished. Tantalum lamps are to be used. There is one controlling shaft for each color—white, red, blue and green. It is planned to add orange lamps at a later date. The hand wheel shown at the bottom of the front view moves the two rods vertically in opposite directions through worm gear and bell cranks. The master levers may be set so as to interlock with either of the rods, dimming or brightening as desired. Dimming of one color and brightening of another can be accomplished noiselessly, conveniently and with fine gradations of light intensity. For further convenience each dimmer plate is provided with its own individual operating lever. Master levers for each color are also provided. Cutler-Hammer simplicity type dimmers have been installed in several European countries during recent years, displacing the water-rheostat dimmer and other large resistance banks that have been in use in Europe.

POWER-FACTOR METERS.

The accompanying illustrations show four types of direct-reading power-factor meters manufactured by the Westinghouse Electric & Manufacturing Company. These meters indicate on a graduated scale the power-factor in the circuit to which they are connected, and operate on the rotating field principle. A rotating field is produced by the current of the metered circuit passing through angularly placed coils. In this rotating field is situated a pivoted iron vane or armature, magnetized by a coil whose current is in phase with the voltage of one phase of the circuit. As the iron vane is attracted or repelled by the rotating field of the series coils, it will take up a position where the zero of the rotating field occurs at the same instant as the zero of its own field. Thus its position will always indicate the phase angle between the voltage and current of the circuit. The pointer attached to the armature therefore indicates this angle, and by marking on the scale the cosine of the angle shown by the graduation the power-factor is read directly. In the three-phase meter the rotating field is produced by three current coils spaced 60 deg. apart, and in the two-phase meter the position of voltage and current coils is interchanged and the rotating field is produced by means of a split-phase winding.



Figs. 1 and 2—Switchboard Power-Factor Meters.

Fig. 4 is a sectional view of the movement of a power-factor meter. The winding shown within the iron ring is the stationary winding of the series or current coils. Inside this are the stationary voltage winding and the pivoted armature. The laminated iron ring surrounding the winding is provided as a return circuit for the flux of the pivoted armature, so that the reluctance of the armature magnetic circuit is low and uniform in all positions.

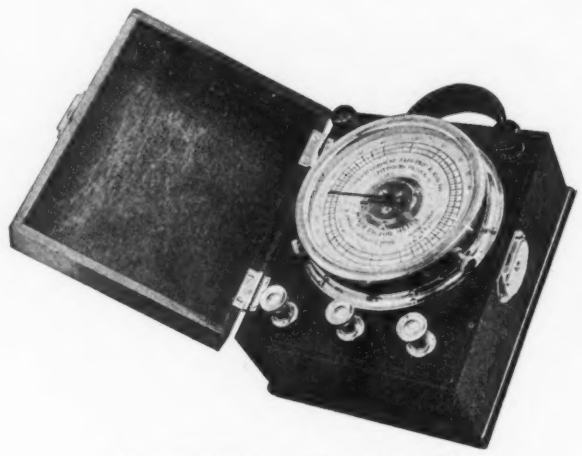


Fig. 3—Portable Power-Factor Meter.

An aluminum disk at the front of the meter serves as a damping disk, moving in the concentrated field of the two permanent magnets at the bottom of the mechanism. These magnets and disk have no effect whatever on the electrical operation of the meter. They serve to prevent oscillations of the pointer and thus make the readings "dead-beat." It is claimed that more efficient damping is obtained with this electromagnetic device than is possible with air-damping devices, unless a delicate and easily deranged adjustment is resorted to.

It will be noted that in this form of power-factor meter no connection is required between the fixed and the moving elements. There being no movable coils used, there are no delicate flexible connecting strips, nor is any control spring necessary, as the controlling force is electromagnetic. The moving element is therefore very light, and the friction and bearing jewel wear a minimum.

All the Westinghouse switchboard types and the polyphase portable types are arranged to read lagging or leading power-factor on the upper half of the scale and for reversed power on the lower half. The switchboard types are adjusted for one standard frequency; the polyphase portables are adjustable to any frequency between 25 cycles and 60 cycles. The single-phase portables indicate for 60 cycles on one-half the scale and for 25 cycles on the other half. The portable meters are very convenient for investigating the power-factor of motor loads and may assist very materially in improving the operation of the system.

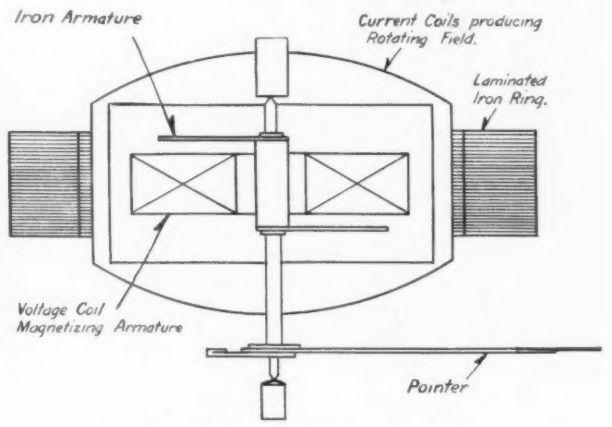


Fig. 4—Cross-Section of Meter.

Industrial and Commercial News

THE WEEK IN TRADE.

GROWING confidence is shown in nearly every section of the country, and the volume of business has increased slightly over that of the preceding week. Much of the advancement has been due to reassuring crop reports. The government's weekly weather report gave news of more rains and lower temperatures in many sections. Now that the West has recovered from the crop scare, sentiment has made a decided change for the better, merchants and manufacturers are now looking for resumption of trade in the majority of industries, while the Western railroads are reporting tonnages in excess of those for this period in the previous year. Owing to the low stocks that have been carried during the past few months, it is expected that the buying movement when once under way will be widespread and will be continued well into the end of the year. Iron and steel trades show further progress, the pig-iron market, especially, being rather active during the week. Contracts were made in the Pittsburgh district for over 100,000 tons of iron, most of which was taken by steel-making concerns. Decline in cotton has resulted in lower prices for certain grades of cotton goods, and the trade is slightly unsettled. Demand for leather continues fairly brisk as a result of resumption of business by shoe factories. Retail trade has been affected to some extent by unsettled weather conditions, while buyers for dress goods and furnishings are still purchasing in limited quantities and chiefly for filling-in purposes. The statement of foreign trade for the fiscal year ended June 30, 1911, was a most satisfactory feature of the week, exports showing a total of $2,048,691,392, an increase of 17.3 per cent over the figure for the previous year. Imports were $1,527,985,088, showing a decrease of 1.8 per cent from the record total of 1910. Business failures for the week ended July 20, as reported by *Bradstreet's*, were 239, as compared with 196 for the previous week, 215 for the same week in 1910, 239 in 1909, 263 in 1909, 263 in 1908, and 155 in 1907.

THE COPPER MARKET.

BUYING of refined copper by domestic and foreign interests was on a very narrow scale during the week, and prices became slightly lower. Sales of a few million pounds of lake and electrolytic for August and September shipments were made, with some electrolytic disposed of at prices under 12½ cents. Foreign statistics show a reduction in stocks abroad during the first two weeks of July of some 5,000,000 lb., but, in spite of this, no increase in the buying movement was induced. Prices abroad have been on a slightly higher level in the past few weeks, and inquiries are said to be on a fair scale, in spite of the few sales made. Foreign orders will undoubtedly contribute the sustaining portion of July business, for domestic consumers, judging from present conditions, are unlikely to be in the market for much copper aside from current needs. Improvement in general trade will naturally direct more business to copper users, and it is hoped that the copper trade on this account will be in a better condition in the fall. Production continues on a large scale, and there is likelihood of further increase within a short time from several newly developed properties. Since there are no prospects at this time for curtailment of output, it seems as though the only manner by which the situation can be improved is by an increasing demand. However, as some little time will be needed for such demand to reach effective proportions, it would appear that the present stagnation is likely to continue for several months at least. Exports for the month, including July 25, aggregate 24,841 tons, indicating that the total will exceed that for the month of June. The daily call on the Metal Exchange, July 25, quoted copper as per the accompanying table.

Standard Copper.	Bid.	Asked.	Settling Price.
Spot	12.00	12.25	....
July	12.00	12.25	12.12½
August	12.00	12.25	12.12½
September	12.00	12.25	12.12½
October	12.00	12.25	12.12½

The London market, July 25, was as follows:

	Noon. £ s d	Closing. £ s d
Standard copper, spot	56 5 0	56 1 3
Standard copper, futures	56 16 3	56 12 6

Extreme fluctuations for this year:

	Highest.	Lowest.
Standard	12.35c	11.57½c
London, spot	£57 10 0	£53 7 6
London, futures	58 2 6	54 0 0
Best selected	61 10 0	57 5 0

INDUSTRIAL AND COMMERCIAL NOTES.

Fight for Westinghouse Control.—A dispatch received from Pittsburgh at 9 o'clock on Thursday morning states that the checking of proxies, which was carried on through the preceding night, has resulted in getting through the letter E only. At this rate the work of tallying the full vote may cover several days. The management when it reconvened at 2 o'clock on Thursday was to state officially the vote up to that time, and a further adjournment seemed probable. The statement of Mr. Westinghouse at the meeting, beyond expressing gratification at the large number of proxies he had received, did not contain any new features.

Westinghouse Orders.—Among recent large orders for self-starting rotary converters received by the Westinghouse Electric & Manufacturing Company is one from the Philadelphia Rapid Transit Company for two 3000-kw, one 2000-kw and two 1500-kw converters, all of the six-phase, 25-cycle, self-starting type, to deliver direct current at 600 volts. The transformers for supplying these rotaries were also ordered from the same company and include six 1100-kw, three 750-kw and six 375-kw air-blast transformers, 25 cycles, for 13,200 volts on the high-tension side. Among other orders is one from the City & County Contract Company for one 80-ton switcher locomotive with quadruple equipment of single-phase, alternating-current motors and unit-switch control for the New York, Westchester & Boston Railroad. The frame and running gear will be built by the Baldwin Locomotive Works. Among export orders is one from the Demarara Electric Company, of British Guiana, South America, for railway motors and control apparatus for the same. Other orders include one for thirty double-equipments of single-phase, alternating-current motors, for motor cars on the New York, Westchester & Boston Railroad, with unit-switch control. From the Capital Traction Company, of Washington, D. C., an order for twenty double-equipments of interpole railway motors and control apparatus. From the Columbia Railway, Gas & Electric Company, of Columbia, N. C, for double equipments of interpole railway motors and control apparatus. From the Pueblo (Col.) Suburban Traction & Light Company, through H. M. Byllesby & Company, of Chicago, three 500-kw, oil-insulated, water-cooled, 44,000-volt transformers. From the city of Barnesville, Ga., for one substation equipment consisting of three 150-kw, oil-insulated, self-cooling, 6600-volt transformers, and one two-panel switchboard. From the Gainesville (Ga.) Railway & Power Company, for two 125-kw, oil-insulated, self-cooling, 11,000-volt transformers, one switchboard and two regulators, constituting a complete substation equipment. From the Cataract Power & Conduit Company, of Buffalo, N. Y., three 300-kw, oil-insulated, water-cooled, 22,000-volt transformers.

United States Telephone Company.—At a meeting of directors of the United States Telephone Company late last week the following officers were chosen: President, Frank A. Davis; vice-president, E. R. Sharp, president of the State Savings Bank & Trust Company, Columbus; secretary and counsel, W. L. Cary, Columbus; treasurer, H. B. Taylor, Columbus; general manager, Gansey R. Johnson, general manager of the Columbus Citizens' Telephone Company, Columbus. All are re-elections excepting that of Mr. Sharp. Mr. Davis is president of the Columbus Citizens' Telephone Company. The regular quarterly dividend of 1½ per cent was declared on the preferred stock, payable Aug. 15 to stockholders of record of July 29. Reports of officers show the affairs of the company in good condition with satisfactory earnings.

Large Railway Motor Orders.—The General Electric Company has received an order for 300 four-motor car equipments from the Chicago Railways Company. This order calls for 1200 35-hp motors and 600 controllers with auxiliary equipment for 300 cars. Among other large orders received by the same company for railway equipment are the following: From the Chattanooga Railway & Light Company, for one 1000-kw motor-generator set, four 1500-kw transformers and a switchboard. From the Pacific Railway Company, Los Angeles, for four 1000-kw motor-generator sets; three 600-kw motor-generator sets; eighteen 450-kw transformers and fifty four-motor 70-hp car equipments with Sprague-General Electric control. From the Portland Railway Company, of Portland, Maine, for one 500-kw and one 300-kw motor-generator set and a switchboard. These units will be installed in new substations and will be supplied with power purchased from the lighting company. The installation of these rotaries will improve voltage conditions and relieve the main power house in Portland. An order has also been placed by the Philadelphia Rapid Transit Company for thirty two-motor car equipments for use on its elevated division and fifty two-motor equipments for use on the surface division. The equipments for the elevated division consist of two 125-hp motors with Sprague-General Electric control, while those for the surface lines consist of two 60-hp, 500-volt motors. The International Railway Company, of Buffalo, has also placed an order for sixty equipments, each consisting of two 60-hp, 500-volt motors.

Electricity on the Catskill Aqueduct.—Mention was made in these columns last week of two large contracts aggregating 7500 hp signed by the New York Edison Company with contractors engaged on the work of the Catskill Aqueduct in New York City. Since that time the New York Edison Company has contracted with Holbrook, Cabot & Rollins, Thomas B. Bryson and George F. Fry for a total of 2250 hp on this work. The Edison Electric Illuminating Company of Brooklyn has also contracted with the foregoing for 1500 hp to be used on the Brooklyn section of the Aqueduct, extending under the East River from Delancey and Allen Streets, Manhattan, to Lafayette Avenue and Fulton Street, Brooklyn. On the Brooklyn section of the work there will be four motor-driven air compressors, each driven by a 200-hp motor, and there will be a number of motor-driven hoists, pumps and concrete mixers. The energy furnished by the Brooklyn company will be 6600-volt, three-phase, 25-cycle, and this will be transformed to 440 volts for the smaller motors. All metering will be done on the 6600-volt side, and the rate of charging, by both the New York and the Brooklyn companies, will be $20 per year per kilowatt of maximum demand and 1 cent per kw hour. The New York Edison Company is also furnishing 2000 hp to George B. Jackson, Inc., the contractor on the Yonkers section of the high-pressure tunnel, and 700 hp to the Thompson-Starrett Company, which is constructing the Woolworth Building in New York City.

Canadian Properties Merged.—A consolidation embracing a number of important Canadian central-station and traction companies has been effected by Sir William MacKenzie and R. J. Fleming, who is manager of the Electrical Development Company, the Toronto Power Company and the Toronto Railway Company. Consummation of the merger will give them control of the following properties: The Toronto Railway Company, the Toronto Power Company, the Electrical Development Company, the Toronto Electric Light Company, the Metropolitan Railway Company, the Toronto & Scarboro Railway Company, the Mimico Electric Railway and the Toronto & Suburban Railway. The MacKenzie interests are also behind the projected Toronto & Eastern Railway, which will be in operation between Toronto and Niagara Falls, in conjunction with the Canadian Northern Railway. It is considered probable that the People's Radial Railway Company, which has been planned to operate in Western Canada, will become part of the MacKenzie-Mann holdings. Mention of the price that the Toronto Power Company, a subsidiary of the Toronto Railway Company, is to pay for the stock of the Toronto Electric Light Company was given in the issue of July 22.

Arc-Light Equipment for Chicago.—The Sanitary District of Chicago has definitely decided to install immediately for street lighting 500 flaming-arc lamps of the long-burning type. Of these, 250 will be of a type used in street lighting in Europe and supplied by the Stave Electrical Company, of New York, and 250 of an American type, developed by the General Electric Company. After sixty days of operation, the rest of an equipment of 4000 lamps will be awarded to the concern whose lamps give most satisfaction, and eventually 15,000 lamps of the kind selected will be installed. Both lamps are of the 10-ampere type and are to operate 100 in series with 55 volts at the arc. As this is the first municipal installation in this country of flaming arcs on a large scale, a successful outcome of the Chicago test will have a wide influence on future street lighting throughout the country.

Westinghouse Turbine for Flour Mill.—Recent extensions and improvements in the power equipment of the Pillsbury Flour Mills, Minneapolis, Minn., have included, among other things, a more general application of electric drive to their milling operations, and to meet this additional electrical load, an order has been given for a 2000-kw Westinghouse turbine of the high-speed, double-flow construction. The condensing equipment, also designed and built by the Westinghouse Machine Company, is of the Leblanc barometric type, which will maintain a vacuum range from 28 to 29 inches, depending upon the temperature and quantity of cooling water used. The turbine is to drive a Westinghouse generator, normally rated at 2500 kw, delivering three-phase, 60-cycle current at 2200 volts.

Pacific Gas & Electric Company Increases Output.—Announcement is made that the Pacific Gas & Electric Company will spend about $10,000,000 in increasing the capacity of its hydroelectric stations by 71,000 hp. The plans provide for the erection of two hydroelectric plants, one of which is to have a capacity of 50,000 hp and the other of 21,000 hp. Provision for increasing the present water storage in Nevada and Placer Counties is to be made by the erection of a dam in the canyon of the South Yuba River. With the new additions to the stations, these will be rated at close to 260,000 hp. The company has about 1100 miles of high-tension lines and serves an area of 33,000 miles in central California.

American Cities Completes Traction Merger.—The purchase of the subsidiary companies of the American Cities Railway & Light Company and those of the New Orleans Railway & Light Company has been completed by the American Cities Company. With these acquisitions the American Cities Company now owns 87 per cent of the total capital stock of the Birmingham Railway, Light & Power Company, Knoxville Railway & Light Company, Houston Lighting & Power Company, Memphis Street Railway Company and the Little Rock Railway & Electric Company, and 93 per cent of the stock of the New Orleans Railway & Light Company.

Leblanc 12,000-kw Condenser.—The Westinghouse Machine Company has received from the Rhode Island Company, Providence, an order for a No. 20 twin-type Leblanc condenser, consisting of a combination of two No. 20 standard Westinghouse Leblanc outfits, equipped with two sets of air and circulating pumps mounted on a common shaft. Couplings at each end of the latter provide for either turbine or motor drive. The condenser is designed to handle approximately 8,000,000 lb. of water per hour, and will operate in connection with a 12,000-kw turbine in the Manchester Street plant of the Rhode Island Company.

Quarterly Earnings of Steel Corporation.—The earnings of the United States Steel Corporation for the quarter ended June 30 were $28,108,520, showing an increase of $4,589,317 over the returns for the quarter ended March 31, and $12,062,440 under those for the same quarter in 1910. The balance available for dividends was $14,527,877, as compared with $12,689,855 in the previous quarter. The surplus for the quarter was $1,869,177. The earnings for six months were $41,627,723, as compared with $77,787,835 for the corresponding period in the previous year.

Long Acre Electric Light & Power Company.—J. D. Maguire, a former consulting engineer for the Long Acre Electric Light & Power Company, who secured a judgment against the company for $25,175 for services rendered, has been restrained by an injunction secured by the company from collecting the judgment or from examining officials of the company in supplementary proceedings. The injunction also restrains Mr. Maguire from applying for a receiver for the company, or assigning the judgment. The company has notified the Secretary of State of an increase in capital stock from $50,000 to $2,500,000.

Aluminum Notes and Prices.—The aluminum market is quiet, with ingots for remelting held at 21@21½ cents, spot No. 1, the base for large ingots, with rods and wire at 31 cents, and sheets at 33 cents, prices being those of July 25.

Financial.

THE WEEK IN WALL STREET.

DECIDED improvement was made in trading on the New York market in the past week, and both activity and tone were greatly broadened. General advances were made after the forward movement of the local traction shares mentioned in the preceding issue, and the higher prices were maintained up to the close on Saturday. Trading on Monday of this week was on a very narrow scale, with the market irregular and declines registered in nearly all of the leading stocks. Further decline in railroad stocks took place on Tuesday upon news that the Interstate Commerce Commission had ordered reductions of freight rates of nearly all the railroads of the country, based upon the Spokane cases. These decisions are the first announced by the commission to contain a definite course to be followed with respect to the long-and-short-haul provision. The reduction will affect the rates on nearly all commodities in interstate commerce. The Union Pacific, Southern Pacific, Northern Pacific and other large transcontinental roads were the defendants in the cases, so that

NEW YORK.

	July 18.	July 25.	Shares Sold.		July 18.	July 25.	Shares Sold.
All. Ch.....	8½*	8½*	100	Int. Met., pf.	55	51	70,950
All. Ch., pf..	28*	28*	———	Mackay Cos..	87*	86½*	350
Amal. Con...	69⅝	68	16,500	Mackay C.,pf.	74¼	74½*	210
Am. D. T...	20½*	20½*	———	Man. Elev...	140	139*	2,740
Am. Loco...	41	40¾*	1,500	Met. St. Ry..	15*	15*	———
Am. Loco., pf.	108*	108*	200	N.Y.&N.J.Tel.	139½*	139½*	———
Am. Tel. & C.	80*	80*	———	Steel, com...	79⅜	79⅜	189,450
Am. T. & T.	137⅝	136½*	8,246	Steel, pfd....	118¼	119	6,335
B. R. T.....	83	82⅛	46,170	W. U. T....	81½	80	5,200
Gen. Elec...	161½*	163½	500	West'h, com.	75½	75	940
Int. Met....	19¾	18⅛	20,450	West'h, pfd..	119*	119*	———

PHILADELPHIA.

	July 18.	July 25.		July 18.	July 25.
Am. Rys.....	44*	44	Phila. R. T.....	21⅞	22¼
El. Co. of A.....	12¼	12¼*	Phila. Elec.....	17⅞	17¾
Elec. St. Bt'y.....	54½*	55¼	Phila. Trac.....	87½*	86¾*
Elec. St. Bt'y., pf...	30*	30*	Union Trac.....	52⅜	52¼

CHICAGO.

	July 18.	July 25.		July 18.	July 25.
Chi. City Ry.....	186*	186*	Chi. Tel. Co.....	123*	123
Chi. Rs., Ser. 1....	90*	97*	Met. El. Co.....	27*	27*
Chi. Rs., Ser. 2....	27⅞	28¼	Met. El., pfd.....	75*	75*
Com. Edison.....	136⅞	135⅞	Nat'l Car.....	113	112½
Chi. Subways.....	3¾	4	Nat'l Car, pfd.....	119*	118½*

BOSTON.

	July 18.	July 25.		July 18.	July 25.
Am. T. & T.....	137⅝	136⅝	Mex. Tel.....	4	4*
Cum. Tel.....	158*	157⅜	Mex. Tel., pfd.....	6½	6¾
Edison E. Ill.....	282	285*	N. E. Tel.....	146	146
Gen. Elec.....	161¾	163	W. T. & T.....	20½	21½
Mass. E. Ry.....	23⅜*	22⅞	W. T. & T., pfd....	97½	98½
Mass. E. Ry., pf....	93½*	93			

*Last price quoted.
Shares sold for the week, July 17 to July 22.

practically all of the transportation business between the Eastern and Western coasts will be affected by the change in rates. The extent to which the roads can meet water competition will be more limited than heretofore. In addition to the unfavorable effect exerted by these decisions, the market was also influenced on Tuesday by disquieting news in regard to the Moroccan situation. Favorable crop reports telling of rains in the corn belt were reflected in declines of about 1½ cents per bushel in corn and slight declines in wheat and oats. The bond market continues firm, and investment offerings are being freely absorbed. The reports of several of the railroads show increases in gross earnings, the gains being considered as signs of general advancement. The ease in the money market is unchanged, as indicated by decreased loans shown by bank statements together with gains in surplus reserve. Rates July 25 were: Call: 2¼@2⅜ per cent; ninety days, 2¾@3 per cent. The quotations in the tables are those of the close July 25.

FINANCIAL NOTES.

Reorganization of Platt Iron Works Company.—The proposed plan adopted by the creditors' committee for readjustment of the affairs of the Platt Iron Works Company provides for a complete reorganization of the company, and also makes arrangements for relieving the reorganized company of all floating indebtedness, and supplying it with sufficient working capital. In keeping with the plan, receivers have been appointed, and are now in charge of the properties, with full authority to carry on and conduct the business. The receivers have been authorized by the court to borrow a sum sufficient to permit the complete operation of the property, and the committee has arranged for such loan. The plan proposes that the committee acquire, as soon as practicable, the business, assets and good will of the Platt Iron Works, by purchase from the receivers, subject to a mortgage, dated November 1, 1904, from the Platt Iron Works Company to the Cincinnati Trust Company, of Cincinnati, Ohio, securing $800,000 par value of first mortgage forty-year gold bonds, of which $798,500 par value will be outstanding. If the purchase is effected, the plan includes a transfer of the business, assets and good-will of the Platt Iron Works Company, subject to the mortgage, to a new corporation to be organized under the laws of Ohio, which shall have a name as similar to the Platt Iron Works Company as practicable. With the quick assets of the present company, and $150,000 cash capital which the committee plans to secure for the new company, for which the latter shall issue long-term securities, the new company should have some $780,000 of quick assets, of which $150,000 will be actual cash. The floating debt, which amounts to approximately $1,368,000, will be converted into securities of the new company. All stock which comes into the possession of the committee will, before distribution to the creditors who have deposited under the creditors' agreement, be subject to a voting trust for a period in the discretion of the committee. Copies of the creditors' agreement for execution may be obtained upon application to Messrs. Sullivan & Cromwell, 49 Wall Street, New York City.

Merger of Northern Illinois Electric-Service Companies.—Messrs. Samuel Insull, Henry A. Blair, Frank G. Logan, Charles H. Randle and H. M. Byllesby constitute the committee in charge of arrangements for the consolidation of the North Shore Electric Company, Economy Light & Power Company and the Illinois Valley Gas & Electric Company, all operating under the direction of Mr. Samuel Insull as president in northeastern Illinois. Mr. John H. Gulick is secretary of the committee, and Isham, Lincoln & Beale are counsel. The plan proposed, to which reference has been made heretofore in these columns, is that the $5,000,000 of North Shore stock shall go in at 120 in common stock of the new corporation, the $3,000,000 stock of the Economy company shall go in at 75 in common stock of the new company, the $3,250,000 of the common stock of the Illinois Valley company shall go in at 25 in the new common stock and the $763,000 of Illinois Valley preferred stock shall go in at 100 of the preferred stock of the new company. Thus the new company will have not less than $9,062,500 of common stock and $763,000 of 6 per cent preferred stock. The Illinois Trust and Savings Bank is the depositary under the agreement for a consolidation which has been drawn up by the committee. The working out of the consolidation will not be undertaken by the committee until two-thirds in par value of the stock of each of the companies has been actually deposited under the agreement. It is understood, however, that more than this amount of stock has been deposited, and there seems to be no doubt that the consolidation will be effected.

Lincoln Gas & Electric Financing.—The Nebraska Public Service Commission has approved the plans for rehabilitating the Lincoln Gas & Electric Company. A. B. Leach & Company have purchased $500,000 6 per cent three-year notes of the company and will offer these, Aug. 1, on a 5½ per cent basis. The proceeds will be used to meet $333,000 6 per cent bonds which mature Sept. 1, and to liquidate floating indebtedness. The plans further provide for an issue of $750,000 8 per cent preferred stock, of which $500,000 is to be used to retire the above-mentioned notes, and the remaining $250,000 will be offered to present stockholders in exchange for $750,000 of the existing common stock, which will reduce this issue to $1,500,000. As a result of these changes, the capitalization of the company will be $2,250,000, as at present, but will ultimately be composed of $750,000 8 per cent preferred stock and $1,500,000 common stock.

Earnings of Cities Service Company.—The statement of earnings of the Cities Service Company for the nine months ended June 30, 1911, shows that earnings on stocks of subsidiary companies owned by this company were $659,286. Miscellaneous earnings were $28,606, and expenses were $19,355, leaving net earnings for the period of $668,537. Dividends amounted to $477,729, of which $371,155 was paid on preferred stock and $106,574 on common stock, which left a surplus of $190,808.

Texas Telephone & Telegraph Company Sold.—Announcement is made that the Texas Telephone & Telegraph Company has sold its 500 miles of toll lines and physical property to the Southwestern Telephone & Telegraph Company, which is a subsidiary of the Bell interests. The consideration was $100,000.

Cleveland Electric Illuminating Company Buys Cuyahoga Lighting Company.—It has been announced that the Cleveland Electric Illuminating Company, Cleveland, Ohio, has purchased the physical property of the Cuyahoga Lighting Company, a concern started four years ago at the instance of former Mayor Tom L. Johnson, who had at that time declared war against the larger company. He desired this to be the nucleus of a large company which would furnish competition to force the Cleveland Electric Illuminating Company to come to terms with the city. Under the terms of this franchise the company was required to file a bond for $25,000 to insure protection against damage to the streets. When the company was first organized this bond was provided, but in 1909 when an extension ordinance was granted the bond was not renewed. For this reason the franchise is not effective at this time, so that the purchase involved only the physical property. The company was organized in 1907 and its franchise covered but a limited territory, its business being confined to furnishing energy to buildings in the neighborhood of the public square. John C. Keys was the organizer and president of the company until about a year ago, when he resigned. The money was furnished by New York men. L. D. West was secretary and manager at the time the sale was made. He states that the sale is the natural result of the duplication of capital in an effort to establish competition in this public utility.

Kings County Electric Light & Power Earnings.—The report of the Kings County Electric Light & Power Company for June and the six months ended June 30 shows that gross earnings of the company for the month were $23,235 in excess of those for the same month in the previous year, and that those for the six months show an expansion of $235,001 for the period. Special power earnings increased 45 per cent, and gross power earnings increased 14 per cent in the six months. The showing is especially noteworthy in view of the revenue lost by the destruction of Dreamland, Coney Island, by fire. Expenses increased $25,433 in the month of June and $168,435 in the six months, as compared with the same period of the previous year. Earnings for the half year were at the rate of 5 per cent on the $10,000,000 stock, indicating at least 10 per cent for the year. Prior to the Coney Island fire mentioned above the company had expected that earnings for the year would show nearly 12 per cent.

Pennsylvania & New York Telephone Company Sale.—The special meetings of stockholders of the Bell Telephone Company of Pennsylvania and those of the Pennsylvania & New York Telephone & Telegraph Company, announced in the May 18 issue for July 18, were held on that day, and the sale of the capital stock, franchises, and corporate property of the latter corporation to the former was ratified. It is announced that the merger is part of the reapportionment-of-territory policy arranged two years ago by the American Telephone & Telegraph Company for its subsidiaries. As a result of the merger the Bell Telephone Company of Pennsylvania now owns and operates the entire Bell system in Pennsylvania east of the Alleghany Mountains.

New Haven Road Sells Bonds of Electric Subsidiary.—The New York, New Haven & Hartford Railroad, it is said, has arranged for the sale of $17,200,000 4½ per cent first-mortgage bonds of the New York, Westchester & Boston Railway Company to New York and Boston bankers. These bonds are a portion of an authorized issue of $20,000,000 which have been held in the treasury of the New Haven road and guaranteed by the parent company, which owns nearly all of the $5,000,000 outstanding stock of the New York, Westchester & Boston. The latter is now building a four-track electric road from 138th Street, New York City, to Port Chester, N. Y., with a branch to White Plains.

Triumph Electric Company to Retire Indebtedness.—Preparations are being made by the Triumph Electric Company, of Cincinnati, Ohio, to place on the market the remainder of its treasury preferred stock for the purpose of securing funds to retire the indebtedness on the new plant at Oakley. It now has $217,300 preferred and $546,400 common stock outstanding, with a surplus and reserve of $107,973. The preferred is 6 per cent cumulative stock. The new plant at Oakley cost about $200,000 and the building loan stands at $107,500. Five new lines have been added to the company's output within the past year.

Asks Receiver for Winona Railway & Light Company.—The Old Colony Trust Company, of Boston, as trustee for the bondholders of the Winona Railway & Light Company, of Winona, Minn., has begun action for the appointment of a receiver. The company is controlled by the La Crosse Water Power Company, of La Crosse, Wis., which passed its bond interest due April 1, as mentioned in the issue of March 30, and which was explained by the abnormal drought in the State in 1910. The present action is brought in default of interest due July 1 on $495,500 outstanding 5 per cent bonds. A hearing has been scheduled for July 27.

Rocky Mountain Bell Telephone Company Sold.—Reference was made in the previous issue to the merger of the Tri-State Telephone Company with the Colorado Telephone Company and to the possibility that the latter would acquire the properties of the Rocky Mountain Bell Telephone Company. It is now learned that the merged companies will be known as the Mountain States Telephone & Telegraph Company, with a capitalization of $50,000,000, and that the latter has acquired the Rocky Mountain Bell company. The Rocky Mountain Company has a debt of some $6,500,000. The officers of the Mountain States company are E. B. Field, president; E. B. Field, Jr., secretary; J. E. MacDonald, auditor, and E. M. Burgess, general manager. Mr. Field states that the new company will operate its exchanges and toll lines over a vast area in the West, and that it is hoped to meet the telephone needs more intelligently and extensively with a single company than could be expected with three separate corporations.

United Railways of St. Louis.—The report of the United Railways Company, of St. Louis, for June, and six months ended June 30, shows favorable gains in the business of the company. Gross earnings for June increased about $34,000 and surplus available for dividends increased about $14,300. During the six months the gross earnings expanded $223,175, while the surplus available for dividends was increased $146,600. From present indications the company will have no difficulty in acquiring a surplus sufficient to meet the 5 per cent cumulative dividend on its preferred stock.

Home Telephone & Telegraph Expenditures in Spokane.—According to Thaddeus S. Lane, president of the Home Telephone & Telegraph Company, over $1,250,000 has been spent to date by the company on the automatic system and stations of the company. The company has about 1060 miles of long-distance connections. It is organizezd under the laws of Washington, with an authorized capital of $1,500,000 of common stock.

Cumberland Telephone & Telegraph Earnings.—Gross earnings of the Cumberland Telephone & Telegraph Company for the month of June were $606,026, an increase of $40,864. Operating expenses were $356,844, an increase of $37,437. Net earnings were $249,182, while fixed charges were $50,044, leaving a surplus of $199,138, an increase of $1,605.

DIVIDENDS.

Amalgamated Copper Company, one-half of 1 per cent, payable Aug. 28.

Butte Electric Power Company, quarterly, preferred, 1¼ per cent, payable Aug. 1.

Fairmont & Clarksburg Traction Company, semi-annual, preferred, 2½ per cent, payable Aug. 1.

National Lead Company, quarterly, preferred, 1¾ per cent, payable Sept. 15; common, three-quarters of 1 per cent, payable Sept. 30.

North American Company, quarterly, 1¼ per cent, payable Oct. 2.

Omaha Electric Light & Power Company, semi-annual, preferred, $2.50 per share, payable Aug. 1.

Pacific Power & Light Company, quarterly, preferred, 1¾ per cent, payable Aug. 1.

Western Telephone Company, semi-annual, preferred, 2½ per cent, payable Aug. 1.

REPORT OF EARNINGS.

Period.	Gross Earnings.	Operating Expenses.	Net Earnings.	Fixed Charges.	Net Surplus
AMERICAN LIGHT & TRACTION COMPANY.					
June, 1911	$313,662	$8.890	$304,772	.....	.....
" 1910	286,209	12,047	274,161	.....	.....
HUDSON & MANHATTAN RAILROAD COMPANY.					
June, 1911	$375,870	$162,502	$213,368	$212,293	$1,075
" 1910	324,169	133,469	190,700	191,357	*658
KINGS COUNTY ELECTRIC LIGHT & POWER COMPANY.					
June, 1911	$376,142	$199,834	$176,308	$114,242	$62,066
" 1910	352,906	172,712	180,194	103,672	76,522
6m., June, '11	2,342,062	1,165,548	1,176,514	674,822	501,692
" " '10	2,107,060	997,112	1,109,948	610,698	499,250

*Deficit.

General News

Construction News.

BIRMINGHAM, ALA.—The Birmingham Water, Light & Power Company, is reported to be preparing plans for the development of water-power at the proposed government locks (in two sections) on Warrior River. The proposed plant will be equipped with six turbine-driven generators. Electricity generated at the plant will be transmitted to Birmingham, Bessemer, Ensley and other cities in the Birmingham district.

BIRMINGHAM, ALA.—The report submitted by Martin J. Lide, engineer, engaged to make investigations of the municipal light and water plant at North Birmingham with a view of making improvements to same for the purpose of supplying light and water to Greater Birmingham, states that the cost of rehabilitating the combined water and electric plant, exclusive of pumping station, would cost approximately $179,870, and if the water works were sold, the cost of the light and power plant would be $170,901. He suggests that the water plant be sold for $70,000, making the total outlay for the electric plant $100,901. The estimates of the cost of the distributing system are as follows: For 6786 poles, at $6.50 each, $44,100; for installation of arc-lamp system, $22,685, and for transmission and distributing system, approximately $35,353. He estimates an annual saving of about $31,174 in the cost of the electrical service by the installation of the plant.

HEADLAND, ALA.—The contract for improvements to the municipal electric-light plant and water-works system is reported to have been awarded to the J. B. McCrary Company, Empire Building, Atlanta, Ga., to cost $7,500.

MOBILE, ALA.—An ordinance was introduced at the last meeting of the City Council providing for placing all electric wires under ground in the business and residence districts of the city.

PHOENIX, ARIZ.—The Water Users' Association will receive bids until Aug. 8 for the construction of power house at Arizona Falls. The cost of the equipment of the plant is estimated at $30,000, bids for which will be called for later. About 900 hp will be developed.

PHOENIX, ARIZ.—The United States Reclamation Service is planning to construct a cross canal, three miles in length, near Scottsdale. The canal is for the benefit of the farmers on the north side of the valley and the money will be furnished by the Salt River Valley Water Users' Association. The cost of the canal is estimated at about $150,000. A power plant capable of developing 7000 hp will be installed, which, it is expected, will bring an annual income of $350,000 for the association.

EL DORADO, ARK.—The El Dorado Light & Water Company is reported to have been granted a new franchise in El Dorado. The franchise calls for the erection of a power house equipped with two sets of machinery and extension of water mains.

HIGDEN, ARK.—It is reported that plans are being made for the construction of a concrete dam and hydroelectric power plant on the Little Red River, near Higden, about 55 miles from Little Rock. Surveys for the proposed plant are being made by Dickinson & Watkins, engineers, State National Bank Building, Little Rock, Ark.

PINE BLUFF, ARK.—Plans have been perfected by the Pine Bluff Corporation for doubling the output of its electrical plant. It is said that a number of manufacturing concerns are equipping their plants for electrical operation.

TEXARKANA, ARK.—The capital stock of the Texarkana Gas & Electric Company has been increased from $200,000 to $500,000, the proceeds to be used for extensions and improvements to its system. The company has recently issued $3,000,000 in bonds to secure funds for extensions and improvements to its street-car system. The company owns and operates natural gas lines from the Caddo fields in Louisiana.

BAKERSFIELD, CAL.—A movement has been started by local merchants toward the installation of a municipal electric plant to supply electricity for lighting the business section of the city.

COLTON, CAL.—The South California Edison Company, it is reported, is contemplating the erection of a large power plant to be located at M and Eleventh Streets.

DECOTO, CAL.—Preparations are being made to install a street-lighting system in Decoto. The Pacific Gas & Electric Company will supply the service.

LOS ANGELES, CAL.—The Board of Supervisors has given instructions for the installation of an electric transmission line between the Kern River station of the Pacific Light & Power Corporation, near Eastlake Park and the County Hospital, to utilize the 50 hp due the county under its franchise.

LOS ANGELES, CAL.—It is reported that final arrangements have been made for the consolidation of the Pacific Light & Power Company, of Los Angeles, Cal., and the San Joaquin Light & Power Company, of Fresno, Cal. Work, it is said, will begin at once on the construction of a large hydroelectric development on Big Creek near Shaver, which when completed, will develop about 300,000 hp. The company will practically control the entire electrical business in southern California. The deal involves an ultimate bond issue of $50,000,000. The headquarters of the company will be located in Los Angeles.

NORTH COLUMBIA, CAL.—Plans are being made by the St. Gothard Consolidated Mining Company, which operates the Delhi Mine, for the installation of an electric plant. The company owns water rights in Bloody Run, which it proposes to develop, for which surveys are now being made.

PASADENA, CAL.—The City Council is reported to have decided to install a fiber-conduit system for carrying electric wires and a vitrified conduit system for telephone wires, work on which has begun. The conduits are to be owned by the city and the companies using the conduits are to pay the city rental for same. The cost of the system is estimated at $45,000. Plans are being made by the city to erect new bronze electroliers, each carrying 80-cp incandescent lamps, the cost of which is estimated at about $30,000.

SACRAMENTO, CAL.—The Sacramento Electric, Gas & Railway Company has applied to the Board of Supervisors for franchises covering three extensions through the suburbs of Sacramento.

SACRAMENTO, CAL.—The Citizens' Light & Power Company has closed a contract with the Great Western Power Company whereby the latter company is to supply electricity to the former for local consumption. Part of the service will be supplied from the plant at Big Meadows and the remainder from a steam auxiliary to be erected near Sacramento. George W. Peltier is president of the Citizens' company.

SACRAMENTO, CAL.—Arrangements are being made by the Citizens' Light & Power Company, a subsidiary of the Great Western Power Company, for installing an electric system in Sacramento, at a cost of about $1,500,000. The company will build an underground conduit system for distribution of electricity. Electrical energy for operating the system will be supplied by the Great Western Power Company. Articles of incorporation will soon be filed by the company. The capital stock is placed at $5,000,000.

SAN FRANCISCO, CAL.—Plans have been prepared by the Pacific Gas & Electric Company for an additional hydroelectric development of 71,000 hp, to cost about $10,000,000. The plans provide for the erection of two plants in the canyon of the South Yuba River, the first having a head of 1647 ft., which will develop 50,000 hp; the second will use the water again and will have a fall of 750 ft. developing 21,000 hp. The overflow of water will be used for irrigation purposes. The company now serves about 33,000 square miles in central California and has about 1100 miles of high-tension transmission lines.

STOCKTON, CAL.—The Santa Fe Railroad, it is reported, is planning to install an electric-light and power plant at its new terminal at Riverbank, Cal., 30 miles west of Stockton. The new shops of the company, it is said, will be located at that place.

VALLEJO, CAL.—Announcement has been made by the City Commissioners that the franchise which the Vallejo Electric Light & Power Company is operating under will not be renewed. The company has been operating under a fifteen-year franchise which will expire on Aug. 15. It is stated that the company will have to operate under the state law until such time as the voters decide whether they wish to own and operate a municipal plant. It is expected that the proposition either to purchase the present plant or to build an entirely new plant will be submitted to the voters.

GREEN MOUNTAIN FALLS, COL.—Electrical service is now being furnished in Green Mountain Falls by the Empire Water & Power Company. The plant is located on Crystal Creek and receives its water supply from the above stream through a pipe 8-in. in diameter, the head upon the single Pelton wheel employed being 490 ft. Energy is generated by a 150-kw, 2300-volt, three-phase, 60-cycle alternator, direct connected to the water wheel. The pipe line is 1026 ft. long. The plant is located about one-half mile from the town and at present is supplying commercial and residential lighting service on the basis of a flat rate. The street-lighting system includes 60-watt tungsten lamps operated on a 110-volt circuit. The plant was planned under the direction of E. L. Benton and George B. Tripp, of the Colorado Springs Light, Heat & Power Company.

GUILFORD, CONN.—The question of installing an electric-light system in Guilford is under consideration. At present the streets are lighted by kerosene lamps.

WINDSOR LOCKS, CONN.—A bill has been introduced in Congress by Senator McLean, of Connecticut, granting the Northern Power Company permission to build dams and develop water power in the Connecticut River in the vicinity of Windsor Locks, Conn. The Northern Power Company is to appropriate all the power created by the dam, except such as shall be necessary for operating and lighting of a

lock to be maintained for transportation purposes. The United States is to own and control the operation of the lock.

WASHINGTON, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Aug. 16 for furnishing and installing lighting fixtures in the United States buildings at Asbury Park, N. J.; Bradford, Pa.; Beverly, Mass.; Chambersburg, Pa.; Chelsea, Mass., and Greensburg, Pa., in accordance with drawings and specifications, copies of which may be obtained at the above office. James Knox Taylor is supervising architect.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 8 for furnishing the various navy yards the following supplies: Brooklyn, N. Y., Schedule 3781—2000 ft. lead-covered cable. Portsmouth, N. H., Schedule 3787—8020 lb. copper pipe. Bids will also be received at the same place until Aug. 15 as follows: Newport, R. I., Schedule 3779—Furnishing and installing a fire-alarm system. Application for proposals should designate schedules desired by number.

MIAMI, FLA.—The Miami Electric Light Company is installing new machinery in its power house, which will double the output of its plant. Preparations are being made by the company to extend its service to Cocoanut Grove, a distance of 6 miles; later the transmission lines will probably be extended as far north as Little River.

PABLO BEACH, FLA.—The installation of an electric-light plant at Pablo Beach is under consideration. If a franchise is granted by the Council steps will be taken at once to install a plant. It is proposed to use a compressed-air machine, invented by H. C. Busby, to generate electricity. C. H. Mann has offered a tract of land for use of the demonstration plant.

PALATKA, FLA.—Bids will be received by the City Council until Aug. 22 for lighting the streets of the city for a period of five years. The specifications call for twenty or more 2000-cp arc lamps and 100 or more 30, 40 or 60-cp tungsten incandescent lamps.

PALATKA, FLA.—The City Council has granted C. S. Hammatt a thirty-year franchise to construct and operate an electric-light plant in Palatka. Under the terms of the franchise the company is to install a plant with an output of 225 kw. The company also agrees to supply electricity for commercial lighting at 12 cents per kw-hour with a discount of 10 per cent for prompt payment. The minimum charge is placed at $1.50 per month. The rate for water service is 4, 5 and 7 cents per kw-hour according to the quantity consumed. The ordinance also provides that the company shall pay the city beginning Feb. 15, 1923, 1 per cent of its receipts until the expiration of the franchise, or until the city takes over the plant by purchase, which it has a right to do at periods of ten, twenty and thirty years, by giving the company three months' notice.

COLQUITT, GA.—The J. B. McCrary Company, of Atlanta, Ga., is reported to have been awarded the contract for improvements to the municipal electric-light plant and water-works system to cost about $15,000.

COLUMBUS, GA.—The Columbus Electric Company is reported to be preparing plans for extensive improvements to its system as follows: To raise the impounding dam at Goat Rock, located 15 miles above Columbus, on Chattahoochee River, to secure a head of 70 ft.; the construction of power house with an initial installation of 3000-kw generating unit with switchboards, transformers and erection of transmission lines necessary to tie the new plant in with existing distributing system, and also to extend transmission lines north to West Point, La Grange and Newman. It is estimated that 15,000 hp can be developed at Goat Rock. The Stone & Webster Engineering Corporation, of Boston, Mass., has charge of the work.

DARIEN, GA.—The City Council, it is reported, has granted a thirty-year franchise for the installation of an electric-light plant in Darien.

DUBLIN, GA.—The Carey-Stephensville Telephone Company, recently incorporated with a capital stock of $12,000, is contemplating the erection of a telephone system through Laurens, Wilkinson, Twiggs and Pulaski Counties.

GAINESVILLE, GA.—The Gainesville Railway & Power Company has been granted a franchise by the City Council to use the streets and alleys for the erection of transmission lines to distribute electricity generated at its plant, located on the Chestatee River.

WASHINGTON, GA.—At an election held recently the city voted to issue bonds to the amount of $30,000, the proceeds to be used for reconstruction of electric-light plant and installation of filter plant. Westinghouse, Church, Kerr & Company, 10 Bridge Street, New York, N. Y., are engineers.

HAILEY, IDAHO.—An agreement has been reached between the Cramer Electric Company and Robert Lansdon, receiver of the Cramer Water Company, whereby the Cramer Electric Company is to supply energy to operate the pumps of the water-works system, under the terms of which the water company is to pay the Cramer Electric Company $125 per month.

ALTON, ILL.—The City Council has appointed a committee to make investigations in connection with the installation of a municipal electric-light plant and to secure estimates of cost of same. The franchise of the Alton Gas & Electric Company, which supplies electrical service in Alton, will expire in November, 1912.

CHICAGO, ILL.—The Chicago Suburban Edison Company, recently organized, has taken over the plant and holdings of the Kankakee Gas & Electric Company, of Kankakee, Ill. The Kankakee company is capitalized at $600,000 and has bonds outstanding to the amount of $700,000. The Chicago Suburban Edison Company was recently formed by a consolidation of the Economy Light & Power Company, of Joliet, Ill.; the North Shore Electric Company, of Chicago, Ill., and the Illinois Valley Gas & Electric Company, of Streator, Ill.

CHICAGO, ILL.—Sealed proposals will be received at the office of the business manager of the Board of Education, 730 Tribune Building, Dearborn and Madison Streets, Chicago, Ill., until Aug. 2, for electric work, telephones and bells in Burke School, Fifty-fourth Street and South Park Avenue, and in Haugan School, Hamlin, Wilson and Sunnyside Avenues, Chicago, Ill., in accordance with plans and specifications prepared by A. F. Hussander, acting architect, and N. L. Patterson, chief engineer, which may be seen at the office of the architect, Room 714, Tribune Building, Dearborn and Madison Streets, Chicago. Proposals must be printed on the regular printed forms, to be obtained at the office of the architect.

EAST DUBUQUE, ILL.—The question of discarding the municipal electric-light plant in East Dubuque and entering into a contract with the Union Electric Company, of Dubuque, Ia., for street lighting is under consideration by the City Council. The municipal electric plant is not able to meet the demands made upon it and it will require quite an expenditure of money to equip the plant and bring it up to date. A large number of citizens are in favor of discarding it and connecting up with the Union Electric Company's system and receiving the same service as given in Dubuque.

OTTAWA, ILL.—Arrangements are being made to incorporate a company to be known as the Chicago, Marseilles & Peoria Railway to build a railway from Chicago to Peoria by way of Marseilles and Streator. The company will be capitalized at $5,000,000. Charles M. Nichols, of New York, N. Y., is promoter.

PEORIA, ILL.—The contract for installation of the light, heat and power plant at the Bradley Polytechnic Institute is reported to have been awarded to Walter Benson. The cost of the plant is estimated at about $25,000.

ROCK ISLAND, ILL.—The Eighteenth Street Improvement Association, of Rock Island, has been organized for the purpose of establishing and maintaining an ornamental street-lighting system on Eighteenth Street, between First and Fourth Avenues. It proposed to remove the present lamps and install standards carrying a cluster of five lamps.

STRONGHURST, ILL.—The local electric-light plant, owned by Steele Brothers, is reported to have been purchased by M. F. Schierbaum, of Okawville, Ill. A ten-year contract, it is said, will be awarded to the new owner of the plant for lighting the streets of the city.

SUMNER, ILL.—The City Council is reported to have granted a franchise to Edward A. Dreiman to install and operate an electric-light plant in Sumner.

COLUMBUS, IND.—The City Council is considering the installation of a new street-lighting system. It is proposed to replace the arc lamps now in use with cluster lamps.

INDIANAPOLIS, IND.—The Board of Public Works has authorized the Indianapolis Light & Heat Company to erect electric lamps on fourteen streets, which will require several hundred new lamps.

JASONVILLE, IND.—The Reliance Engineering Company, which operates the local light and water plants, has decided to improve the two plants. New machinery will be installed in the electric plant and additional wells will be driven for the water-works system.

LINTON, IND.—The City Council has decided to issue $10,000 in bonds, the proceeds to be used for extensions and improvements to the municipal electric-light plant. It is proposed to remove the plant from its present location to another site on the railroad. In addition to installation of new machinery, about seventy additional lamps will be added to the street-lighting system.

MARTINSVILLE, IND.—The City Council has appropriated $7,000 for improvements to the street-lighting system. It is proposed to install ornamental lamp standards.

MITCHELL, IND.—It is reported that the local electric-light plant has been purchased by James S. Goodrich, of Winchester, Ind. The new owner is said to be preparing plans for the installation of a water-works system to be operated in connection with the electric plant.

PETERSBURG, IND.—The Town Trustees of Petersburg would like to receive bids from responsible parties for lighting the streets of the town for a term of ten years. An exclusive franchise will be given. The town has a large commercial business.

VALPARAISO, IND.—The power house of the Valparaiso & Northern Railway Company was destroyed by fire recently.

CORNING, IA.—At an election held recently the proposition that the city purchase and operate the local electric-light plant was defeated.

DES MOINES, IA.—The Urbandale Improvement League has appointed a committee to take steps to secure the installation of an electric-light system in Urbandale.

DES MOINES, IA.—The State Fair Board has entered into a contract with the Des Moines Electric Company to supply electricity for lamps and motors for the State Fair grounds. It is not expected that many improvements will be made this year. It is planned by next year to erect a system of electroliers along the principal avenues similar to those used in the city of Des Moines.

PERRY, IA.—The citizens have voted to grant a franchise to B. C. Dilenbeck, of Perry, to construct and operate an electric street railway in this town.

CHAPMAN, KAN.—Preparations are being made for the construction of an electric-light plant and water-works system in Chapman, plans and specifications for which are being prepared by Burns & McDonnell, engineers, Scarritt Building, Kansas City, Mo.

NESS CITY, KAN.—The City Council has decided to call a special election to vote on the proposition to issue bonds to the amount of $16,000, the proceeds to be used to build an electric-light plant in Ness City. It is proposed to take over the distributing system of the Ness City Mill, Light & Ice Company. The electric plant of the company was destroyed by fire on June 23.

SOLOMON, KAN.—The installation of an electric-light plant in Solomon is reported to be under consideration, plans for which are being prepared by Burns & McDonnell, Scarritt Building, Kansas City, Mo., consulting engineers.

SYRACUSE, KAN.—The Council has engaged the J. S. Worley Company, of Kansas City, Mo., to prepare plans for the proposed electric-light plant and water-works system in Syracuse. At a special election held July 14 the proposition to issue $40,000 in bonds was carried; of the proceeds $33,000 will be used for water-works system and $10,000 for installation of an electric-light plant.

TOPEKA, KAN.—Plans are being made by the City Commissioners for the installation of an ornamental street-lighting system in the business portion of the city, for which proposals have been asked.

TOPEKA, KAN.—Bids will be received by the State Board of Control, Topeka, Kan., until Aug. 2, for furnishing electric-light globes to the State Charitable Institutions for Kansas for a period of one-year from date of contract. The contract will be awarded on a basis of 5000 lamps as ordered by the chief executive of the following institutions: Topeka State Hospital, Topeka, Kan.; Osawatomie State Hospital, Osawatomie, Kan.; State Hospital of Epileptics, Parsons, Kan.; State Home for Feeble-Minded, Winfield, Kan.; School for Deaf, Olathe, Kan.; School for Blind, Kansas City, Kan.; Kansas State Orphans' Home, Atchison, Kan.; Boys' Industrial School, Topeka, Kan.; Girls' Industrial School, Beloit, Kan. H. C. Bowman is chairman of board and Charles W. Gibbs, secretary.

DANVILLE, KY.—Plans are being prepared by a syndicate of Boston capitalists to develop the water-power of Dix River, at Kennedy's Mill, where it is estimated that at least 6000 hp can be developed. The plans call for the construction of a concrete dam 110 ft. in height, about 1 mile above the mill. Electricity generated at the plant will be transmitted to Richmond, Harrodsburg, Stanford, Lancaster, Danville and Nicholasville. The cost of the proposed plant is estimated at $1,250,000.

NEWPORT, KY.—Steps have been taken by the City Council to ask for bids for lighting the streets of the city at the rate of $55 each per year for arc lamps and $24 each for incandescent lamps. The Union Light, Heat & Power Company has offered to furnish the service at $65 and $27 each per year respectively. The Council is also considering the abolishment of the minimum charge of 85 cents per month to private customers.

BANGOR, MAINE.—Plans have been prepared by the Bangor Railway & Electric Company for the construction of a new substation in Bangor, work on which will begin in the near future.

BANGOR, MAINE.—The hydroelectric plant of the Bodwell Water Power Company at Old Town and Milford, Maine, on the Penobscot River, has been purchased by John R. Graham, president of the Bangor Railway & Electric Company. It is understood that it is proposed to construct a dam across the Stillwater branch of the river, thus completing the original project. The price paid for the plant is said to be about $500,000.

PORTLAND, MAINE.—Extensive improvements are contemplated by the New England Telephone & Telegraph Company to its local system, which will involve an expenditure of about $250,000 and include the erection of the new exchange building, now under construction, to cost about $100,000, the installation of new switchboard and equipment at $100,000, and $50,000 for cable work preliminary to the removal of the exchange from its present location on Exchange Street to the new exchange on Forest Avenue.

FT. HOWARD, MD.—Contracts for the installation of an electric-light plant and system at Ft. Howard, Md., have been awarded as follows: For wiring and repairs to buildings, to S. J. Watson, Jr., of Hampton, Va., for $7,931; for poles, lines, switches, etc., to the National Electrical Company, of Washington, D. C., for $4,861; for meters, transformers, switchboard and engines, to Thomas C. Bassbor Company, of Baltimore, Md., for $7,523, and to L. B. Jacobs, of Newark, Del., for building, for $2,020.

BOSTON, MASS.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 19 for six switchboard feeder panels for the navy yard, Boston, Mass. The feeder panels are to be used on a 125-250-volt, three-wire, direct-current system. Plans and specifications can be obtained on application to the bureau or to the commandant of the navy yard named. R. C. Hollyday is chief of bureau.

GREENFIELD, MASS.—The large elevator and power plant located between Cheapside and East Deerfield on the Deerfield River, owned by the Massachusetts Broken Stone Company, of Boston, Mass., was destroyed by fire July 16, causing a loss of from $10,000 to $15,000.

GREENFIELD, MASS.—The State Board of Gas and Electric Light Commissioners has approved of the petition for the consolidation of the Greenfield Electric Light & Power Company, of Greenfield; the Shelburne Falls Electric Light & Power Company, of Shelburne Falls, and the Colrain Electric Light & Power Company, of Colrain. The board has also granted the consolidated company permission to issue $175,000 in additional capital stock.

HUNTINGTON, MASS.—The Huntington Electric Light Company is contemplating a change in the location of its power plant, placing it about 200 ft. up the river. The installation of a new waterwheel, etc., is also contemplated. E. E. Stanton is superintendent.

MEDFORD, MASS.—The Malden Electric Company has applied to the Board of Aldermen for permission to install underground conduits in Salem and High Streets.

RANDOLPH, MASS.—The Randolph & Holbrook Electric Light Company has submitted a proposition to the Selectmen offering to install cluster tungsten lamps in place of the arc lamps along the main streets of the town.

SALEM, MASS.—Announcement has been made by the Salem Electric Company of a reduction in the price of electricity from 13 cents per kw-hour to 12 cents per kw-hour, to take effect from Aug. 1, 1912. The reduction was voluntary on the part of the company.

STERLING, MASS.—The question of extending the electric-lighting system from Sterling Center into the Redstone district and other farming sections is under consideration.

NILES, MICH.—Sealed bids will be received by the Board of Public Works, of Niles, Mich., until Aug. 15 for two 300-kva, three-phase, 60-cycle, 600-r.p.m., belted generators, complete with slide rails, pulley and field rheostats; two 10-kw, 125-volt, 1600-r.p.m., type "S" belted exciters, complete with slide rails, pulleys and field rheostats; also two switchboards to control the above generators. Hermann Roebeck is city clerk.

MINNEOTA, MINN.—The installation of an electric-light plant in Minneota is reported to be under consideration. The cost of the proposed plant is estimated at $10,000.

MORA, MINN.—The Eastern Minnesota Electric Light & Power Company, it is reported, has been granted a franchise to supply electricity for lamps and motors in Mora.

MORRIS, MINN.—A committee, consisting of C. A. Dushek, P. R. Putnam and others, has been appointed to make investigations to secure the cost of the installation of an ornamental street-lighting system in Morris.

ST. PAUL, MINN.—The installation of a new street-lighting system is said to be under consideration by the Board of Public Works. The specifications for street lighting will be ready for examination for contractors interested in the street-lighting contract to go into effect Jan. 1, 1912. The cost of installing new arc lamps for street lighting is estimated at about $50,000.

TOWER, MINN.—Contracts have been awarded for the construction of the municipal electric plant, bids for which were opened July 18, as follows: To the Bowe-Burke Company, of Duluth, Minn., for erection of power house, at $13,000; for electric and hydraulic equipment to the Dwyer-Field Company, of St. Paul, Minn., for $5,280, and to the Western Missabe Company, of Duluth, Minn., for erection of transmission system, at $4,827. D. A. Reed, of Duluth, Minn., is consulting engineer.

WINONA, MINN.—Action has been brought by the Old Colony Trust Company as trustee for the bondholders of the Winona Railway & Light Company, of Winona, Minn., asking for an appointment of a receiver. The action is brought in default of interest on outstanding bonds of $495,000, amounting to $12,500, due July 1.

BETHANY, MO.—Burns & McDonnell, Scarritt Building, Kansas City, Mo., engineers, are reported to be preparing plans for water-works purification system and for improvements to municipal electric-light plant, to cost about $30,000.

BOONVILLE, MO.—The power plant and laundry of the Missouri Training School are reported to have been badly damaged by fire recently, causing a loss of about $20,000. It is understood that the plant will be rebuilt at once.

CAPE GIRARDEAU, MO.—Plans are being considered by the Cape Girardeau-Jackson Interurban Railway Company for the construction of a new substation in Cape Girardeau, contracts for which will be awarded within the next six months.

LAMAR, MO.—It is reported that plans and specifications are being prepared by Rollins & Westover, Beals Building, Kansas City, Mo., consulting engineers, for improvements to the electric-light system and water works. The cost of the proposed work is estimated at about $75,000.

LIBERTY, MO.—Sealed proposals will be received by the board of trustees of the Odd Fellows' Home, Liberty, Mo., until Aug. 4 for furnishing material and constructing additions to the Old Folks' Building, power plant and pump houses. Separate bids to be submitted for installation of power plant equipment and heating and plumbing apparatus. Plans and specifications for the entire work are on file at the office of the board and at the office of J. H. Felt & Company, architects, Kansas City, Mo., where copies of plans may be secured.

MEXICO, MO.—The City Council has granted the Mexico Power Company a franchise to install and operate a central heating plant for a term of thirty years. The company owns the water-works system, electric-light plant and gas plant in Mexico. It is proposed to utilize the exhaust steam from the electric plant for the heating system. The Mexico Power Company supplies electricity for lamps and motors in Centralia, Mo., 14 miles distant.

MEXICO, MO.—The City Council has adopted a resolution to increase the price for electrical service supplied by the municipal electric plant. The rate for electricity for lamps will be increased from 6 cents to 7 cents per kw-hour; the rates for motors will be as follows: For the first 200 kw, 5 cents per kw-hour; for the next 300 kw, 4 cents per kw-hour and for all over 500 kw, 3 cents per kw-hour. A. L. Nichols is superintendent of the municipal electric-light plant.

RUBY, MONT.—It is reported that the Madison River Power Company contemplates extending its transmission line to Twin Bridges.

GRAND ISLAND, NEB.—The Grand Island Electric Company, it is reported, is planning extensive improvements to its plant, including the erection of a concrete smoke stack 172 ft. high and 12 ft. in diameter, contract for which has been awarded. The company has also placed contracts for a 500-kw turbine, which it is expected will be installed this fall, and also boilers with a rating of 200 hp.

FALLON, NEV.—Bids will be received by the United States Reclamation Service, Department of the Interior, Fallon, Nev., until Aug. 1, for furnishing and delivering one revolving-type drag line scraper excavation machine, built and equipped for electrical operation, with three-phase, 60-cycle alternating current at 440 volts, the base frame and boom to be of steel construction. D. W. Cole is engineer.

ATLANTIC CITY, N. J.—The Pennsylvania Railroad Company is reported to have purchased the old power plant of the Atlantic City Electric Company, located at Kentucky and Baltic Avenues, in this city.

FREEHOLD, N. J.—William J. Lansley, of Perth Amboy, N. J., has purchased the property of the Manalapan Light Company, which operates electric plants in Freehold and Englishtown, at a receiver's sale. The power plant is located in Englishtown. Arrangements are being made by the new owner to increase the output of the plant. The plant of the Jamestown Light & Water Company, of Freehold, N. J., was purchased by Victor P. Christofferson, of Perth Amboy, N. J. Both plants were purchased by parties representing the bondholders.

HACKETTSTOWN, N. J.—The Council has renewed the contract for street lighting with the Hackettstown Electric Light Company for one year at $2,800. Under the new contract the arc lamps now in use on Hope and Main Streets from the Lackawanna station to the junction at Mill Street will be discarded and clusters of four 60-cp incandescent lamps substituted and between each of these two lamps of the same power will be erected; 240 incandescent lamps will be installed where ten arc lamps have been used.

HARRISON, N. J.—The citizens of Harrison, East Newark and Kearny are contemplating the establishment of an electric plant erected by private capital to supply electricity for street lighting and for private consumers unless the Public Service Electric Company makes a further reduction in the price of street arc lamps. The company has offered to supply 144 or more 2000-cp arc lamps at $80 each per year, which is $5 less per year per lamp than the town is paying under the present contract.

KEYPORT, N. J.—The Board of Public Utility Commissioners has given its approval to the proposed issue of $5,000 in bonds by the Middlesex & Monmouth Electric Light, Heat & Power Company, of Keyport, N. J.

PATERSON, N. J.—It is reported that the Society for Establishing Useful Manufactures, which controls the water-power at Passaic Falls, is planning to build an electric power house at Passaic Falls, work on which will begin next spring. The initial installation will have an output of 2000 hp, which later will be increased to several times that amount. Richard Rossiter is secretary of the company and John H. Cook, chief engineer.

TRENTON, N. J.—Plans are being considered by the Trenton-Mercer County Traction Company for increasing the output of its plant in Trenton by 750 kw.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has agreed to make extensive improvements in its plant to meet the requirements of the proposed new street-lighting system if awarded the contract for lighting the city for a term of years. The present contract expired July 14, but the company will continue the service until other arrangements are made.

BINGHAMTON, N. Y.—The question of asking proposals for street lighting is under consideration by the City Council. Propositions will be submitted by the Binghamton Light, Heat & Power Company and the Binghamton Gas Company. To carry out the contract either company will require six months to install the lighting system. The Binghamton Light, Heat & Power Company, it is said, will submit prices on arc lamps of not less than 500 watts each; 60-cp tungsten lamps, 100-cp tungsten lamps and 100-watt tungsten lamps. Prices will also be submitted for supplying electricity for lamps and motors in the city buildings. The gas company will submit proposals for furnishing incandescent gas lamps and naphtha gas lamps.

LESTERSHIRE, N. Y.—Plans are being considered for improving the street-lighting system in Lestershire. It is proposed to make the change first in the business district and then extend it to the residence portion of the town.

LONG ISLAND CITY, N. Y.—The Public Service Commission has given its approval of plans for equipping the Port Washington branch of the North Shore division of the Long Island Railroad for electrical operation. The cost of the work including equipment is estimated at about $3,000,000.

NEW YORK, N. Y.—Bids will be received by Arthur J. O'Keefe, Commissioner of Department of Bridges, 13 to 21 Park Row, New York, N. Y., until Aug. 3 for furnishing and installing electrical feeder cables on the Williamsburg Bridge. Blank form and specifications may be obtained at the office of the Department of Bridges.

NEW YORK, N. Y.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until Aug. 16 for the installation of a vacuum cleaning system for the new United States post office building in New York, N. Y., in accordance with drawings and specifications, copies of which may be obtained at the above office or at the office of McKim, Mead & White, 160 Fifth Avenue, New York, N. Y. James Knox Taylor is Supervising Architect.

NYACK, N. Y.—The Rockland Light & Power Company has applied to the Public Service Commission, Second District, for authority to issue $100,000 in bonds, the proceeds to be used for extensions to its gas-distributing system in the villages of South Nyack, Grand View and Piermont, for purchase of gas holder, auto track, construction of reservoir and cooling plant at its Orangeburg plant and the installation of additional electric equipment.

PERRYSBURG, N. Y.—The contract for the construction of the power house of the J. H. Adam Memorial Tuberculosis Hospital, being erected in this village by the city of Buffalo, has been awarded to Charles A. Hager, of Perrysburg, N. Y.

ROCHESTER, N. Y.—Plans have been submitted to Mayor Edgerton by Thomas H. Yawger, superintendent of the Rochester Railway & Light Company, for lighting Exposition Park. It is proposed to install a series of the opalescent lamps such as are used in the downtown sections.

SAND LAKE, N. Y.—The Wynantskill Hydro-Electric Company has applied to the Public Service Commission, Second District, for permission to begin work on construction of an electric power plant at Wynantskill Creek in the town of Sand Lake and for authority to exercise franchises within that town and to issue $7,500 in capital stock. The company proposes to supply electricity for limps and motors in West Sand Lake, Snyder's Lake, Reichard's Lake, Averill Park, Sand Lake, Crooked Lake, Burden Lake and other towns and villages in this vicinity.

UTICA, N. Y.—Under a decree granted by order of Judge W. Ray, in the United States District Court at Utica, Senator H. D. Hinman, of Binghamton, N. Y., as special master, will sell the plant and other properties of the Madison Gas & Electric Company, at Wampsville, on Aug. 21. The decree also provided for the sale of the properties of the Hudson River Water & Power Company, of which the Madison County company is a subsidiary, at Balston Springs, on Aug. 29. Charles W. Andrews is one of the receivers of the Hudson River Water & Power Company.

ASHBORO, N. C.—The City Council is reported to have awarded contracts for improvement to electric-light plant and water-works system to the J. B. McCrary Company, Empire Building, Atlanta, Ga. The cost of the work is estimated at about $10,000.

GRAND FORKS, N. D.—The City Council, it is said, is considering the construction of a dam in Red Lake River.

AKRON, OHIO.—Proposals will be received by the Board of Education, Akron, Ohio, until Aug. 7 for furnishing and installing light fixtures in the South High School, schedules for which may be seen at the office of the clerk of the Board of Education and at the offices of Harpster & Bliss, architects, Nantucket Building, Akron, Ohio. Frank Fiebeger is president of board.

CINCINNATI, OHIO.—The contract for installation of additional steam and electrical equipment and switchboard at the City Infirmary at Hartwell, Ohio, has been awarded to the General Electric Company, of Schenectady, N. Y., for $3,000.

CLEVELAND, OHIO.—The plant and holdings of the Cuyahoga Light Company have been sold to the Cleveland Electric Illuminating Company. The Cuyahoga company was formed in 1907 to furnish electrical service in the downtown business section of the city. L. D. West is secretary and manager of the Cuyahoga company.

CLEVELAND, OHIO.—The Cleveland Electric Illuminating Company has announced another reduction in the price of electricity to take effect from July 1. Under the new schedule the price per kw-hour has been reduced from 12½ cents to 10 cents for the minimum number of units fixed by the company for each house. All energy consumed over the minimum amount will be charged at 5 cents per kw-hour.

COLUMBUS, OHIO.—An ordinance has been introduced in the City Council providing for the issue of $265,000 in bonds, to provide funds for extensions to the municipal electric-light system in order to enable the plant to enter the commercial field.

DEFIANCE, OHIO.—Work has commenced by the Auglaize Power Company on the construction of a dam across the Auglaize River three miles south of Defiance, in connection with its proposed power plant. The dam will be 700 ft. long and 30 ft. high. It is expected to have the plant ready for operation in the spring. The proposed plant will have an output of 6000 hp, of which about 1500 hp will be utilized in Defiance and the remainder in Toledo. Later work will begin on two other plants by the company.

MOUNT VICTORY, OHIO.—The local electric-light plant, owned by Henry Conklin, has been purchased by the Mount Victory Bank Company. The plant has been closed down and the town has been without electrical service for several months. It is expected that a new company will be formed to operate the plant.

RIDGEWAY, OHIO.—The Mount Victory Bank Company has purchased the local electric-light plant, which has been out of service for several months. A new company, it is expected, will be formed to operate the plant.

ST. MARYS, OHIO.—The City Council has engaged the W. K. Palmer Company, engineer, of Kansas City, Mo., to take charge of proposed improvements and extensions to the municipal electric-light plant and water-works system. C. F. Lambert is chief engineer of the W. K. Palmer Company, engineer.

PAWHUSKA, OKLA.—At an election held recently the proposition to issue $60,000 in bonds, the proceeds to be used for extensions to the electric-light plant and water-works system, was carried.

SENTINEL, OKLA.—It is reported that all bids for equipment for proposed electric-light plant were rejected. The city, it is said, will purchase equipment and material for plant. F. Murch & Company, of Clinton, Okla., are engineers.

ADAMS, ORE.—The Pacific Power & Light Company, of Portland, Ore., is contemplating extending its transmission lines to Adams, Ore.

HILLSBORO, ORE.—The Tualatin Valley Electric Company has executed a mortgage in favor of the Merchants' Savings & Trust Company, of Portland, Ore., covering its plant and real estate in Sherwood, to secure a bond issue of $20,000.

NORTH BEND, ORE.—T. B. Nolan, of Omaha, Neb., is negotiating for the purchase of the property of the Flanagan & Bennett Water Power Company. The deal is held in abeyance pending the granting of a franchise. If the deal is closed extensive improvements will be made by the purchaser, including the construction of a new reservoir.

PENDLETON, ORE.—It is reported that plans have been prepared by W. C. Knighton, of Salem, Ore., state architect, for the installation of a power plant for the new State Insane Hospital to be erected in Pendleton.

BLOOMSBURG, PA.—The Borough Council has adopted an ordinance under which the Columbia Power, Light & Electric Railwayys Company will be charged $500 per year to operate in this borough. The company recently increased its rates for electrical service in Bloomsburg.

CHESTER, PA.—The City Council is considering the question of improving the street-lighting system and the installation of ornamental lamps on the principal thoroughfares in the city. The street-lighting contract will soon expire and it is proposed to make arrangements to improve and extend the street-lighting service under the new contract. The Beacon Light Company supplies electrical and lighting service in Chester.

EPHRATA, PA.—The City Council has awarded the contract for the installation of a 150-hp boiler at the municipal electric-light plant to the Coatesville Boiler Works, for $1,000.

FAIRVIEW, PA.—Sealed proposals will be received by the Pennsylvania Commission to Erect a State Hospital for the Criminal Insane, care of H. G. Ashmead, secretary, 608 Real Estate Trust Building, Philadelphia, Pa., until Aug. 8 for the construction of new buildings known as dining-room building K, kitchen building L, bakery building M, laundry building T, power building V, ice house W, reservoir, system for sewage disposal and equipments for kitchen, bakery, laundry and power building pertaining to the State Hospital for the Criminal Insane, at Fairview, Pa. Drawings, specifications and form of proposal may be had on application at the office of J. M. C. Shirk, architect, 518 Philadelphia Bank Building, Philadelphia, Pa. Henry F. Walton is chairman.

HARRISBURG, PA.—It is reported that the property and holdings of the Harrisburg Light, Heat & Power Company have been purchased by Bertron, Griscom & Jenks, Philadelphia bankers. Application has been made at the State Department for a charter for the Harrisburg Electric Service Company, which will take over the plant and holdings of the Harrisburg Light, Heat & Power Company. The new company, it is said, will have affiliation with interests controlling the McCall's Ferry plant, and it is proposed eventually to secure energy from that plant to operate the local system. E. Z. Wallower is president of the Harrisburg Light, Heat & Power Company.

PHILADELPHIA, PA.—The issuing of a $15,000,000 mortgage by the Connecting Railway Company to the Girard Trust Company is reported as a preliminary step in the plans of the Pennsylvania Railroad Company to equip its suburban railways out of Philadelphia for electrical operation. The Connecting Railway is a subsidiary of the Pennsylvania company with more than 30 miles of track in this city, which is used by the latter company to connect with its branches.

SHARON, PA.—The Republic Railway & Light Company, recently incorporated with a capital stock of $17,000,000, to take over the property and holdings of the Mahoning & Shenango Valley Railway & Light Company, is contemplating extensive improvements and extension of lines in this vicinity, which will involve an expenditure of about $3,000,000. The local power house will be enlarged and new equipment installed.

WILLIAMSPORT, PA.—The Scootac Power Company has applied to the City Council for a franchise to supply electricity in Williamsport. It is understood that the company has also applied for franchise in Bellefonte and Milton. The company is planning to erect a large electric power plant at Scootac, 7 miles west of Lock Haven.

CHARLESTON, S. C.—The City Council has engaged Lamar Lyndon, of New York, N. Y., consulting engineer, to make investigations and submit report on the advisability and cost of the city installing a municipal electric-light plant.

CHARLESTON, S. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 12, for a 12-in. electrically driven suction dredge for the United States navy yard at Charleston, S. C., plans and specifications for which may be obtained on application to the above bureau or to the commandant of the navy yard named. R. C. Hollyday is chief of bureau.

MINOT, S. D.—It is reported that preliminary plans have been prepared by Burns & McDonnell, Scarritt Building, Kansas City, Mo., consulting engineers, for the installation of an electric-light system in Minot.

PLANKINTON, S. D.—The City Council has granted W. A. Kuntze a franchise to install and operate an electric-light plant in Plankinton.

CHATTANOOGA, TENN.—It is reported that the Georgia Power Company, which is building a hydroelectric plant at Tallulah Falls, is seeking a franchise to enter Chattanooga to supply electricity.

McKENZIE, TENN.—The date for receiving proposals for the construction of the proposed electric-light plant and water-works system in McKenzie, Tenn., has been extended from July 27 until Aug. 3. For further information address F. D. Walpole, recorder.

AUSTIN, TEX.—The Southwestern Telephone & Telegraph Company has purchased the plant and holdings of the Texas Telegraph & Telephone Company. The system acquired embraces about 500 miles of toll lines and exchanges at Llano, Mason, Fredericksburg, Marble Falls, San Saba and Austin. The consideration was about $100,000.

BROWNSVILLE, TEX.—The San Benito & Rio Grande Railway Company has applied to the City Council for a franchise to construct and operate a gasoline motor railway system in Brownsville. S. A. Robertson is president of the company.

CLEBURNE, TEX.—The Gulf, Colorado & Santa Fe Railway Company has awarded contract for construction of a power house in Cleburne, to cost about $13,000, to H. D. McCoy, of Cleburne.

DALLAS, TEX.—A proposition has been submitted to the Dallas Chamber of Commerce by C. H. Alexander to supply electricity in Dallas from the hydroelectric generating plant at Marble Falls, Tex.

FLORESVILLE, TEX.—The installation of an electric-light plant and ice plant in Floresville is under consideration. J. H. Bell, of San Antonio, is interested in the project.

FT. WORTH, TEX.—The Ft. Worth Power & Light Company, recently incorporated with a capital stock of $3,560,000, it is said, will take over the property and holdings of J. R. Nutt, of Cleveland, Ohio, who is constructing a plant in Ft. Worth. The incorporators are: J. R. Nutt, George Holbrook and others, of Cleveland, Ohio; George T. Reynolds, T. B. Yarbrough and others, of Ft. Worth, Tex.

MENARD, TEX.—The installation of an electric-light plant in Menard is reported to be under consideration. E. C. Clark, of Chicago, Ill., is interested in the project.

MISSION, TEX.—The Mission Land Improvement Company is preparing plans for the construction of an electric plant and ice plant and water-works system in Mission. The water-works system will include the construction of a 50,000-gal. reservoir and a steel standpipe having capacity of 50,000 gal. A pumping plant will also be installed.

SAN ANTONIO, TEX.—Dr. F. S. Pearson, of New York, N. Y., and associates, who are interested in the Medina Irrigation Company, which is constructing a large dam across the Medina River, near San Antonio, are reported to be considering the construction of an electric interurban railway to extend from San Antonio to the site of the reservoir and down the valley of the Medina River, where it is proposed to reclaim more than 100,000 acres. The proposed railway will be about sixty miles in length, for which preliminary surveys are being made. Plans are being made to build a large hydroelectric plant at the dam, which will supply electricity to operate the railway and for other industrial enterprises.

TENAHA, TEX.—The City Council has granted a franchise to C. C. Swindell to install and operate an electric-light plant in Tenaha, work on which will begin at once.

PARK CITY, UTAH.—The City Council has granted the Knight Power Company a franchise for a term of fifty years to erect and maintain a 44,000-volt transmission line from Park City to Mill Creek over property owned by the city, under the terms of which the company is to pay the city $300.

PROVO, UTAH.—The Knight Power Company has decided to make extensions to its transmission lines and connect up its different power

plants at the hills to facilitate and augment its transmission system. The company will erect a new line from the Murdock power plant on Provo River, 9 miles east of Heber, along Parley's Canyon and on to Midvale. The cost of the work is estimated at $50,000.

CLARENDON, VT.—The Clarendon Power Company, recently incorporated with a capital stock of $500,000, is making arrangements for the erection of a power plant at Clarendon gorge on the Mill River. It is proposed to develop about 6000 hp at an estimated cost of about $500,000. The company has applied to the Board of Aldermen of Rutland for the appointment of a committee to locate poles for wires for its transmission lines in that city. It is expected to have the plant in operation and supply electricity in Rutland by Jan. 1, 1912. L. B. Dow, of Boston, Mass., is president of the company and F. C. Davis, of Springfield, is secretary.

FT. ETHAN ALLEN, VT.—The contract for building an addition to pump house and installing electrical pumping machinery and remodeling electric-light system at Ft. Ethan Allen has been awarded to L. B. Jacobs, of Newark, Del., for $18,396.

ALEXANDRIA, VA.—The Alexandria County Electric Lighting Company has executed a mortgage for $1,000,000 in favor of the Philadelphia Trust Safe Deposit & Insurance Company, of Philadelphia, Pa., to secure an issue of the same amount in bonds, of which $300,000 are to be issued at once. The balance are not to be issued until improvements or extensions have been made and actually paid for and must aggregate 15 per cent more than the amount of bonds issued at that time. The proceeds of the $300,000 are to be used for the installation of new equipment in the company's plant on the river front and for extension of its service into adjacent territory not now served by the company. The company is a reorganization of the Alexandria Electric Company. Leo P. Harlow is vice-president and F. R. Willer, general manager.

MARCUS, WASH.—Work has commenced on the construction of the new electric-light and water systems being promoted by H. V. Gates, of Hillsboro, Ore. Electricity for operating the electric plant will be transmitted from Meyers Falls. The cost of the electric system is estimated at $10,000 and that of the water works at $25,000.

ZILLAH, WASH.—The Zillah Light & Water Company, organized by local men, is planning to install an electric-light plant to furnish electricity to light the town and for manufacturing plants.

MORGANTOWN, W. VA.—The Cheat River Development Company, recently incorporated with a capital stock of $50,000, is planning extensive developments along the Cheat River for which surveys are now being made. The work will include the erection of a dam and large power plant. Charles W. Held, W. L. Hyatt, John M. Gleason, Frank P. Weaver and Glenn Hunter, all of Morgantown, W. Va., are interested in the project.

MENDOTA, WIS.—Bids will be received by the State Board of Control, Washington Building, Madison, Wis., until Aug. 2, for construction of central heating and power station at the Wisconsin State Hospital for the Insane, at Mendota, Wis., according to plans and specifications prepared by H. J. Thorkelson, consulting engineer, Madison, Wis., which are on file at the office of the State Board of Control, office of the superintendent of the State Hospital for the Insane; Builders and Traders' Exchange, Milwaukee, Wis., and the office of the consulting engineer, Madison, Wis. W. H. Graebner is president State Board of Control.

ST. NAZIANZ, WIS.—The Oslo Dam Electric Light Company, it is reported, is planning to supply electricity in St. Nazianz, and will also furnish electrical service in Cato and Whitelaw.

VANCOUVER, B. C., CAN.—Arrangements have been made by the British Columbia Electric Railway Company to export electricity from Canada into the town of Sumas, Wash., under an agreement to furnish electrical energy to the municipality of Sumas for a term of ten years. The taxpayers have voted to appropriate funds necessary to erect the transmission line and distributing system for electrical service in that town.

BRANDON, MAN., CAN.—The date for receiving tenders for two 2,000,000-gal. variable-speed pumps and other machinery necessary to equip the municipal pumping station to be operated by electricity, and to be installed so as to permit the present steam plant to be used as a duplicate, has been extended from July 17 to Aug. 7. Tenders will also be received for a Diesel gas engine of same capacity. Harry Brown is clerk of City Council.

WINNIPEG, MAN., CAN.—Announcement has been made by Mayor Evans, of Winnipeg, that the city of Winnipeg has decided to purchase the property of the Winnipeg Electric Railway Company, which includes an electric railway system, with franchise of fourteen years to run, power plant, located 60 miles east of the city, and an electric plant and gas plant. The consideration is said to be $15,000,000.

MIMICO, ONT., CAN.—The Village Council has rejected the offer of the Hydro-Electric Commission to supply electricity on the ground that the municipality was not large enough to undertake the project at present. The Council has decided to enter into a contract with the Erindale Power Company, of Erindale, Ont., to supply fifty street lamps for a term of three years, at $600 per year. At the expiration of the contract it is expected that the municipality will be in a position to enter the Hydro-Electric power union. The proposition submitted by the Hydro-Electric Commission would cost the town from $2,000 to $3,000 per year to install and maintain a plant, this amount including interest on $7,500, which was the estimated cost of installing the municipal plant. It is understood that the rate for private consumers for domestic lighting will be either 6 cents per kw-hour or the Toronto hydro-electric rate of 4 cents per hundred square ft. of floor area, plus 3 cents per kw-hour for all energy consumed.

ORILLIA, ONT., CAN.—The ratepayers on July 17 voted in favor of the by-law appropriating $80,000 for enlarging the municipal electric-light plant.

PORT STANLEY, ONT, CAN.—A by-law appropriating $12,750 for the installation of hydroelectric power, to be supplied by the Hydro-electric Power Commission, will be submitted to the ratepayers about Aug. 9. The cost of the entire project is estimated at about $20,000; the amount over $12,750 will be advanced by the Hydroelectric Power Commission. The local electric plant and distributing system, owned by Walter Mitchell, will be taken over by the city at a cost of $6,875. As soon as the work is completed a transmission line will be extended to Sparta to supply electricity to farmers and residents in that district.

STRATFORD, ONT., CAN.—The Stratford Light and Heat Commission is considering a proposition submitted by the H. W. Johns-Manville Company to utilize the boilers in the municipal plant for steam heating purposes. The local system is operated by electrical energy supplied by the Hydro-Electric Commission, the local plant being maintained for emergency purposes.

TORONTO, ONT., CAN.—Announcement of a reduction in the rate for electricity has been made by the Toronto Electric Light Company to meet the prices of the Hydroelectric system. Under the new schedule there will be no minimum charge and no charge will be made for lamp renewals, and the rates for electricity for lamps are as follows: For four, five and six-room house, the first 10 kw-hours will be charged at the rate of 8 cents per kw-hour, after that 3 cents per kw-hour; for seven and eight-room houses, the first 15 kw-hours the charge will be 8 cents per kw-hour, all over that amount 3 cents per kw hour; for nine and ten-room houses, first 20 kw-hours, 8 cents per kw-hour, over that 3 cents; for eleven and twelve-room houses, first 25 kw-hours, 8 cents per kw-hour, over that 3 cents. Larger houses will be charged a special rate, according to installation.

TORONTO, ONT., CAN.—It is reported that plans have been completed by Sir William MacKenzie and R. J. Fleming for the consolidation of the following companies: The Toronto Railway Company, the Toronto Power Company, the Electrical Development Company, the Toronto Electric Light Company, the Metropolitan Railway Company, the Toronto & Scarboro Railway Company, the Mimico Electric Railway Company and the Toronto & Suburban Railway. In addition to above companies the projected Toronto & Eastern Railway, in which Mr. MacKenzie and Mr. Mann are interested, is to be operated in connection with the Canadian Northern Railway. The Toronto & Eastern Railway is an electric line extending from Toronto to Niagara Falls over the right-of-way of the Electrical Development Company. Negotiations are said to be under way for taking over the People's Radial Railway Company, which proposes to operate through middle-western Ontario. R. J. Fleming, manager of the Electrical Development Company, the Toronto Power Company and the Toronto Railway Company, which controls the Toronto and York Radial Railway Company, it is stated, will soon become manager of the Toronto Electric Light Company.

MONTREAL, QUE., CAN.—Announcement has been made by the Grand Trunk Railway system that it will adopt the telephone system for train dispatching over its entire system. The cost of installation of the telephone system is estimated at $500,000, and will include three circuits. W. W. Ashald, of Montreal, Que., Can., is superintendent of telegraph.

NORIA, SONORA, MEX.—H. A. Smith, of Tucson, Ariz., it is reported, is planning to erect a large power plant near Noria, Sonora, Mex., for the purpose of supplying electricity to the mines and smelters in this vicinity and also for lighting the town of Llano.

OAXACA, MEX.—The installation of a large hydroelectric plant in Tomellin Canyon, in the State of Oaxaca, is being promoted by Maurice Clark. A large number of provisional contracts have been placed by Mr. Clark in the mining districts within a radius of 100 miles of the proposed plant.

PACHUCA, HIDALGO, MEX.—Plans are being prepared by Andrew Mackenzie for the installation of a large hydroelectric plant in this State. It is proposed to utilize the water powers of the Tula and Moctezuma Rivers to generate electricity for transmission to the Zimapan district, where it will be used to operate the machinery in the mines and mills.

New Industrial Companies.

THE BIJUR MOTOR LIGHTING COMPANY, of New York, N. Y., has been incorporated with a capital stock of $375,000 by George H. Engelhard, 17 East Ninety-seventh Street, New York, N. Y.; Chester E. Mann, of 20 Conklin Avenue, Brooklyn, N. Y., and Marian I. Dempsey, 28 St. Nicholas Place, New York, N. Y. The company proposes to manufacture electric apparatus, lighting apparatus for autos and manufacture and deal in auto supplies, etc.

THE INTERNATIONAL FRITCHIE COMPANY, of Wawarsing, N. Y., has been chartered with a capital stock of $500,000. The incorporators are: D. O'Connor, A. Sheard and H. A. Fluckiger, of New York, N. Y. The company proposes to manufacture motor vehicles, etc.

THE LAMONT POWER PRODUCER & ECONOMIZING DEVICE COMPANY has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of $30,000. The incorporators are: S. Lamont, S. E. Chadwick and C. R. M. Pye, Trenton, N. J.

THE McCUE COMPANY, of Buffalo, N. Y., has been incorporated by J. W. Lansing, I. T. Gleason, B. H. Bean, H. A. Kamman, of Buffalo, N. Y., and C. T. McCue, of Hartford. The company is capitalized at $700,000 and proposes to manufacture electric, gasoline and steam vehicles.

THE NEW YORK FRITCHIE COMPANY, of Wawarsing, N. Y., has filed articles of incorporation with a capital stock of $200,000 for the purpose of dealing in all kinds of motor vehicles, etc. The incorporators are: D. O. O'Connor, A. Sheard and H. A. Fluckiger, all of New York, N. Y.

THE OIL POWER COMPANY, of New York, N. Y., has been chartered with a capital stock of $100,000 for the purpose of manufacturing oil and other engines. The incorporators are: L. Wygodsky, F. L. C. Keating, G. W. Bunnell, of New York, N. Y.; J. E. Parsons, of Mariners Harbor, and W. F. Turner, Jr., of Jersey City, N. J.

THE PHILADELPHIA MOTOR COMPANY has filed articles of incorporation under the laws of the State of Delaware, with a capital stock of $100,000. The incorporators are: J. F. Green, of Philadelphia, Pa.; J. L. Wolcott and H. R. Martindale, of Dover, Del.

THE PORTLAND ELECTROCHEMICAL COMPANY, of Portland, Maine, has been incorporated with a capital stock of $200,000 to manufacture and sell electrochemical and electrothermal machinery and products. S. Wilson is president and clerk, and E. M. Dyer treasurer, both of Portland, Maine.

THE PROTECTION DEVICES COMPANY, of New York, N. Y., has been incorporated with a capital stock of $25,000 by Colcord Upton, 1218 Madison Avenue, Baltimore, Md.; C. H. Briscoe, 2588 Bedford Avenue, Brooklyn, N. Y., and James A. McNelus, 404 Sixth Avenue, New York, N. Y. The company proposes to manufacture safety devices, etc.

THE J. A. SEITZ COMPANY, of Syracuse, N. Y., has been chartered with a capital stock of $50,000 by J. A. Seitz, B. M. Seitz and J. W. Seitz. The company proposes to manufacture motors, engines, etc.

THE SMITH-DELAHANTY ELECTRIC PUMP COMPANY, of Hartford, Conn., has been incorporated under the laws of Connecticut. The company proposes to make a specialty of a rotary pump that it has developed, and also a piston for automobile engines, for which a patent has been issued. The company will also manufacture electric governors and electric switches.

THE STANDARD CEMENT POLE COMPANY OF AMERICA, of Jersey City, N. J., has filed articles of incorporation with a capital stock of $300,000 for the purpose of manufacturing cement poles known as "Rubello-Santi' reinforced cement poles. The incorporators are: John Santi, 10 Wall Street; Samuel Weiner and V. C. Bogardus, 150 Nassau Street, all of New York, N. Y.

THE STANLEY DIFFERENTIAL HUB COMPANY, of Logansport, Ind., has been incorporated by E. D. Morgan, G. W. Stanley, Zachary Taylor and Joseph Taylor. The company is capitalized at $60,000 and proposes to establish a plant to manufacture parts of machinery used in automobiles and electrical devices and supplies of all kinds.

THE STATISTICAL SERVICE COMPANY, of Jersey City, N. J., has been chartered with a capital stock of $100,000 by A. R. Smart, E. E. Gore and J. R. Turner, of Jersey City, N. J. The company proposes to perform tabulations and calculations by use of mechanical or electrical devices, etc.

RICHARD H. THOMAS, Inc., of New York, N. Y., has filed articles of incorporation with a capital stock of $12,000 for the purpose of manufacturing and dealing in gas engines, mill supplies, etc. The incorporators are: J. M. Shellabarger, 30 Church Street, Charles B. Walker, 176 Centre Street, and E. M. Hardy, 30 Church Street, all of New York, N. Y.

THE WARD EQUIPMENT COMPANY, of New York, N. Y., has been granted a charter with a capital stock of $1,000;000 to manufacture contracting machinery, tools, supplies, railway construction supplies, etc. The incorporators are: L. F. Purtill, U. D. Thomas, both of New York, N. Y., and W. S. Woodrow, of Brooklyn, N. Y.

THE WILSON STORAGE BATTERY COMPANY, of New York, N. Y., has been incorporated with a capital stock of $200,000 by F. D. Underwood, J. C. Stuart, of New York, N. Y., and D. H. Wilson, Jr., of Meadville, Pa. The company proposes to manufacture storage batteries, etc.

New Incorporations.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed for the California Consolidated Light & Power Company, with a capital stock of $5,000,000, by C. S. Goodrich, J. T. Pigott, T. E. Palmer, Grover O'Conner and G. R. Ray.

LEROY, ILL.—Articles of incorporation have been filed for the Leroy Telephone Company with a capital stock of $15,000 by B. F. Baker, Celia E. Baker and A. J. Keenan.

PETERSBURG, ILL.—Articles of incorporation have been filed for the People's Telephone & Telegraph Company, of Menard County, with a capital stock of $100,000 by D. W. Frackelton, A. J. Parsons and Henry H. Colby, all of Petersburg.

SHERIDAN, IND.—The Bakers Corner-Horton Telephone Company has filed articles of incorporation with a capital stock of $6,000. The incorporators are: Charles B. Jones, Frank M. Folk and Ernst Hodson.

WISCASSET, ME.—The Wiscasset Electric Light & Power Company has been granted a charter with a capital stock of $10,000. The company proposes to supply electricity in the town of Wiscasset for lamps and motors. Electricity for operating its system will be secured from the Portland Power & Development Company's plant at Damariscotta Mills. Herbert W. Hawes is president of the Wiscasset Electric Light & Power Company, and A. R. Smith is treasurer.

Personal.

MR. MARTIN A. OBERLANDER, of the Western Electric Company, New York, returned last week from Europe after an absence of two months.

MR. R. E. T. PRINGLE, who formerly represented the Moloney Electric Company, of St. Louis, in Montreal, has been appointed manager of the company's new plant at Windsor, Ont.

MR. D. A. HEGARTY, whose association with the New Orleans Railway & Light Company was noted in this column last week, will be general manager for that company of its railway operating department and the commercial electric department.

MR. VAL. A. FYNN, well known for his writings and inventions relating to alternating-current commutator motors, has returned to London, England, after spending considerable time in this country developing new types of motors for the American market.

MR. THOMAS DOWNS has been appointed by the Illinois State Board of Administration consulting engineer to have charge of electrical work and mechanical work at the seventeen State charitable institutions, with headquarters in the offices of the board at Springfield.

MR. CHARLES A. RICHARDSON, of the Boston office of the Postal Telegraph Company, has been advanced to superintendent of the New England section. For ten years Mr. Richardson, who started with the company as an operator, has been manager of the Boston Postal office.

MR. E. E. WALLACE, for some time past in the service department of the General Vehicle Company, in Boston, has been promoted to the head of his department. He will have charge of all installations and mechanical details for the General Vehicle Company of New England.

CAPT. D. DE KHOTINSKY, who will be remembered by older readers as one of the earliest European incandescent lamp makers, has been appointed curator of the Kent Chemical Laboratory at the University of Chicago—a position for which his unusual experience in both mechanical and chemical work fits him admirably.

MR. CHARLES R. UNDERHILL has been appointed electrical engineer for the Acme Wire Company, with offices at New Haven, Conn. Mr. Underhill was until recently superintendent and chief engineer for the American Electric Fuse Company of Muskegon, Mich. He is the inventor of a number of signaling and wireless-telegraph devices and is the author of a work on electromagnet windings in which a number of original formulas are given.

MR. THEODORE H. CURTIS has been appointed mechanical engineer of the Chicago Association of Commerce's committee of investigation on smoke abatement and electrification of railroad terminals. He has been superintendent of motive power and machinery of the Louisville & Nashville Railroad. Like Mr. Burt, the chief engineer of the committee, Mr. Pattison, the electrical engineer, and Mr. Evans, the terminal engineer, Mr. Curtis is a practical railroad man.

MR. M. S. SEELMAN, JR., of the Edison Electric Illuminating Company of Brooklyn, has resigned as editor of the N. E. L. A. *Question Box*, which will hereafter be edited by Mr. Ernest A. Edkins, of the Commonwealth Edison Company. The work on the *Question Box* is a labor of love and has been ably handled by Mr. Seelman, who made an enviable record as editor. Mr. Edkins is not without editorial experience, however, having edited the *Edison Round Table* for some time.

MR. C. S. RUFFNER has opened an office for the Mississippi River Power Distributing Company in the *Post* Building, St. Louis, preparatory to the construction of the transforming substation which will receive 100,000-volt hydroelectric energy from the Keokuk development, distributing it among the local power companies for augmenting their steam-station output. Although but thirty-one years of age, Mr. Ruffner has enjoyed unusual experience in large power-transmission work with the Telluride Power Company and the Central Colorado Power Company in the West. He is a graduate of the University of Missouri and is a member of the American Institute of Electrical Engineers.

MR. PUTNAM A. BATES has been appointed director of agricultural engineering and machinery exhibits for the American Land and Irrigation Exposition, which is to be held in Madison Square Garden next November. This exposition has on its advisory and governing board the Governors of over twenty States and the presidents of several of the largest railroad systems, including the New York Central, Pennsylvania, Burlington and Union Pacific. It is the intention of Mr. Bates to give particular attention in his department to electrical applications, which

are now multiplying so rapidly in the rural districts. At the present moment he is engaged with Mr. T. C. Martin in the issuance of a series of articles in a popular periodical on the utilization of central-station circuits for country properties and small farms within striking distance of central power houses.

MR. JOHN L. FAY has resigned as superintendent of construction of the overhead system of the Union Electric Light & Power Company, St. Louis, to become general sales engineer of the firm of W. N. Matthews & Brother, of the same city. The departure of Mr. Fay from the central-station company was marked by a farewell banquet tendered by Chief Engineer S. B. Way, and on July 15 the electrical department of the Union company also gave a banquet at which sixty-eight former associates were present, and during which a diamond ring was presented to the guest of honor. Mr. Fay entered the electrical field in the early eighties, his first experience being in connection with the Vanderpoele series arc system. After serving in the operating branch of the Elgin Arc Light Company, Elgin, Ill., he joined the National Electrical & Manufacturing Company, of Eau Claire, Wis., to take charge of the construction of small central stations throughout the country. In 1891 he went with the Tucker Electrical Equipment Company, of New York City, with which he had charge of field work in the construction of isolated plants, and two years later joined the Dundee Electric Light Company and Dundee Electric Railway Company as superintendent of construction. From 1897 to the present Mr. Fay has been superintendent of overhead and underground construction with the Laclede Power Company, the Imperial Electric Light & Power Company and the Union Electric Light & Power Company. He is the inventor and patentee of a number of electric devices, among others being the Fay insulator, which eliminates the use of a tie wire.

Obituary.

WILLIAM PENN HAZELTINE, for many years electrical superintendent of the Lynn Gas & Electric Company, died July 18 in Lynn, Mass., after a protracted illness. He was a native of New Hampshire and for a time was principal of the evening drawing school in Lynn. He was one of the first constructing engineers of the Thomson-Houston Electric Company and in 1890 became connected with the Lynn Gas & Electric Company. He was a graduate of the Lynn High School and of the Friend School in Providence. A widow and four children survive him.

Trade Publications.

RUBBER PACKING.—The Mechanical Rubber Company, Cleveland, Ohio, has issued Section D of its loose-leaf catalog devoted to rod packings, sheet packings and gaskets. Those illustrated are intended for ordinary service.

DIRECT-CURRENT INTERPOLE MOTORS.—Veritys Ltd., of Birmingham, Eng., has issued publication No. 634 on direct-current interpole "Aston" motors. The publication consists chiefly of a schedule of outputs and prices.

ENGINE-TYPE GENERATORS.—The Lincoln Electric Company, Cleveland, Ohio, has issued a bulletin describing its engine-type generators, which are built in ratings ranging from 37½ kw to 300 kw. The make-up of the machines is described in detail.

RHEOSTATS.—The American Fuse Company, Muskegon, Mich, manufacturer of the Allen-Bradley type of rheostats, starters and controllers, has issued a loose-leaf price list on its compression rheostats for alternating-current and direct-current work, including battery-charging work.

AUTOMATIC SECTION INSULATORS.—A folder, No. 4206, on Westinghouse automatic section insulators has been issued by the Westinghouse Electric & Manufacturing Company. The folder gives the applications with style numbers, sizes of wire and cross-sectional views.

MAZDA LAMPS.—Bulletin No. 4850, recently issued by the General Electric Company, describes the new drawn-wire tungsten filaments with which "Mazda" lamps are now equipped. The bulletin states that the pressed tungsten filaments formerly made were inclined to be delicate; the drawn-wire filaments now used in these lamps do not suffer from this disadvantage, inasmuch as they are many times stronger at all periods during life.

AUTOMOBILE INSTRUMENTS.—The General Electric Company has recently issued Bulletin No. 4848, describing its new combination ammeter and voltmeter. This instrument is inclosed in a dust-proof and moisture-proof aluminum case, and is designed to withstand the constant vibration and exposure incident to service on electric vehicles. The publication contains dimension and connection diagrams and illustrations in actual size of the scales.

SINGLE-PHASE INDUCTION MOTORS.—Bulletins Nos. 3142 and 3143 issued by the Emerson Electric Manufacturing Company, St. Louis, Mo., are devoted to descriptions of single-phase induction motors of the full-load-start clutch type, back-geared with countershaft, in sizes ranging from ⅓ to ½ hp, and without back gear in sizes ranging from 1-20 to ½ hp respectively. Although built in frames familiar to small motor users for some years, the motors embody improvements in design.

AVERAGING INSTRUMENT FOR CIRCULAR CHART RECORDS.—The Bristol-Durand radii averaging instrument for circular chart records is described in Bulletin No. 147A issued by the Bristol Company, Waterbury, Conn. It can be applied to records of any kind on circular charts of uniform graduations, such as records of watts, amperes, pressure, etc., making recording instruments equipped with circular charts available for a number of applications for which it was previously thought necessary to use instruments using straight-line or striped-record charts.

MOTOR CONTROL IN NEW YORK CITY.—A handsomely executed booklet entitled "Cutler-Hammer Control in New York City" has been issued by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., illustrating and describing installations of its motor and lighting control in New York buildings, which include a number of interesting features. A map of the city bound into the booklet proved especially useful at the time of the volume's appearance during the recent National Electric Light Association convention, as copies were sent to members and visitors in attendance.

TOBIN BRONZE.—The Ansonia Brass & Copper Company, New York, has issued a booklet on tobin bronze which is a combination of copper and other metals. Its tensile and transverse strength is the same as ordinary mild steel and it is adapted for a variety of purposes where a strong, non-corrosive metal is required. When finished it has a bright golden color. Its specific gravity is 8.379. When used in the form of rolled plates, bolts and rivets in contact with salt water it has given favorable results. In weight it is slightly less than copper.

SWITCHING APPARATUS AND MEASURING INSTRUMENTS.—Dr. Paul Meyer, A. G., Berlin, Germany, has issued an attractive catalogue on switching apparatus and switchboard instruments for high-tension work up to 25,000 volts. The catalogue is divided into eight chapters devoted to oil switches for switchboards; switch cabinets; fuses and protective devices; instruments; ground detectors and synchronizing apparatus; lightning arresters; switch pedestals, bench boards, etc., and the final chapter gives the dimensions of the various apparatus described.

PORCELAIN DECORATIVE SOCKETS AND RECEPTACLES.—Pass & Seymour, Inc., Solvay, N. Y., have issued Form No. 670, describing their ready-wired porcelain receptacles and their applications. The receptacles are designed to be attached to a building or any structure desired to be outlined in electric light. They carry the wires 1 in. from the wall and carry the screws 2½ in. apart on centers. The wires are sealed and every connection between the terminals and the wire is soldered. Ready-wired receptacles may be supplied in streamers of any length up to 1,000 ft.

ELECTRIC CRANES AND CONVEYORS.—The Pawling & Harnischfeger Company, Milwaukee, Wis., has issued an attractive new 48-page catalogue, "The Plant and Its Products," covering the subjects of its products, which include electric cranes, traveling hoists, lumber conveyors, drills, boring machines, grab buckets, etc. The company manufactures its own motors and controllers for its hoisting and conveying equipment. Several pages of the catalogue are given over to description and illustrations of the very complete mechanical plant of the company overlooking the Menominee Valley at Milwaukee.

STEEL CABINET.—The Agutter-Griswold Company, Seattle, Wash., has issued a leaflet on its steel gutter box, which has been developed for porcelain cut-out installations. A 2.5-ft. gutter is provided all around, with liners of steel instead of slate. Standard knock-out holes are punched in both the box and the liners, and the insertion of porcelain bushings in these holes gives a most satisfactory job. The style of construction makes the low-priced article suited especially to that class of wiring work which is too good for ordinary steel boxes and yet is not good enough to warrant panelboards in plate-lined cabinets.

FIXTURES.—The F. W. Wakefield Brass Company, Vermilion, Ohio, has issued Catalog No. 10, devoted to electric fixtures for tungsten lamps. A new commercial-type, round, patented fixture has been brought out, which is especially adapted for lighting public buildings, offices, stores, auditoriums, etc. The body is constructed on the same principle as the company's square type, that is the arms are held in place by clasping them between two castings in the body. The arms are interchangeable, and any stem can be used for either two, three, four or five lamps, including the bottom lamp. The fixtures are said to be easy to wire and to hang, and to possess plenty of room for wire connections.

ARC-WELDING DYNAMO.—The Lincoln Electric Company, Cleveland, Ohio, has issued a bulletin on its arc welder. The latter is fundamentally a variable voltage machine, the voltage at the arc depending entirely on the amount of current flowing. There is no ohmic resistance used on the usual work, and since there is but one machine, the no-load losses are said to be small compared with those of a motor-generator set. Where the supply is alternating, a motor-generator set is required, but in this case the company claims to be able to eliminate the use of any resistance, so that the efficiency of the output remains high, and the regulation is said to be as good as it is when the supply is from a direct-current source.

COMPARATOR.—The potentiometer has for many years afforded a ready means for the standardization of direct-current ammeters and voltmeters, and previous to the introduction of the "comparator" there were no means comparable with the potentiometer, from the standpoint of simplicity, for the calibration of alternating-current ammeters and voltmeters. With the comparator such instruments can be calibrated

rapidly and accurately from 1/20 amp up and from 5 volts up. An alternating-current-direct-current comparator is described in Catalog No. 72 issued by the Leeds & Northrup Company, Philadelphia, Pa. It is an instrument in which the alternating current or voltage being measured is compared directly with a direct current which can be accurately measured. Its action is the same whether currents be direct or alternating.

BUSINESS NOTES.

MR. C. H. CLARK has been appointed to take charge of the advertising department of the Goulds Manufacturing Company, Seneca Falls, N. Y.

THE NORTHWEST ELECTRICAL EQUIPMENT COMPANY, manufacturers' agent, formerly at 530 Lumber Exchange, Portland, Ore., has moved to 7 North First Street, where it occupies ground-floor offices. Mr. Banes, formerly with the J. C. English Company, is manager of the firm.

CUTLER-HAMMER, PORTLAND (ORE.) OFFICE.—Because of increasing business in the Northwest, Otis & Squires, the Pacific Coast agents of the Cutler-Hammer Manufacturing Company, of Milwaukee, have established a branch office in Portland, Ore., in charge of Mr. G. L. Priest, and located at 229 Sherlock Building.

THE YOUNGSTOWN ARMATURE & CONSTRUCTION COMPANY has received an order from the City Investment Company, of Cleveland, for a five-panel combination lighting and motor-control switchboard, and an order for a seven-panel switchboard from the Republic Rubber Company, of Youngstown, Ohio.

CUTLER-HAMMER OUTING.—The fourth annual outing of the Cutler-Hammer Manufacturing Company, of Milwaukee, was held on July 22 at Waukesha Beach. There were a baseball game, races and athletic contests, a guessing contest for ladies and a grab-bag for the children. A basket luncheon was eaten in a grove, and the picnic proved to be a thoroughly enjoyable one.

MUNNING-LOEB COMPANY.—A. P. Munning and W. L. Loeb announce the establishment of a new company, with main office and works at Matawan, N. J., to be devoted exclusively to the design and manufacture of electroplating and buffing equipment and supplies. The company has a large and modernly equipped plant under the supervision of experts of long experience in the industry.

FAN-MOTOR WARMTH BLAST.—The Central Electric Company, of Chicago, is marketing a new fan motor "Warmth Blast," a protected heating element being attached to the blade guard of the fan motor and connected to the lead wire which supplies electric current to the motor itself. The fan blowing air through the heated coil warms the air, which in turn warms cold rooms, dries wet clothing and hair and keeps the show window free from frost.

THE MORRIS IRON COMPANY, of 88 West Street, New York City, reports an increased business in the ornamental lighting field. Although the company manufactures a large number of designs, the principal calls are for five-lamp standards with four inverted and one upright globe; arc poles for luminous or magnetite arc lamps, and combination trolley and lighting poles. Recent orders include five-lamp standards to be installed at Marshal, Mich., and Richmond, Va.

CLEVELAND TWIST DRILLS.—At the Atlantic City convention in June of the Railway Master Mechanics and Master Car Builders' Association the Cleveland Twist Drill Company gave a demonstration of the capabilities of its drills for high-speed and heavy work. The highest rate of drilling speed known, it is stated, in machine shop practice was attained by a 1¼-in. "Paragon" flat-twist drill, which removed 70.35 cu. in. of cast iron in one minute, and repeatedly cut through a billet at the rate of 57½ in. per minute, or almost 1 in. per second. In another test a 2½-in. milled drill cut sixty-eight holes through a billet of machinery steel 4¼ in. thick without being reground.

THE U. S. ELECTRICAL MANUFACTURING COMPANY, Los Angeles, Cal., reports the sale and installation of U. S. motors for individual drive during the month of June to the following southern California concerns: Los Angeles Manufacturing Company, six motors, total 75 hp; Washington Iron Works, twelve motors; Roberti Brothers, twelve motors; Western Sanitary Enameling Company, seven motors; Brenan Shoe Company, twenty motors; Artistic Hardware & Fixture Company, nine motors; San Francisco Elevator Company, eight motors; Diamond Laundry Company, seven motors; Royal Laundry Company, six motors; Charles C. Chapman, four motors; Brock & Feagans, four motors.

ASHLEY P. PECK, for six years identified with the Allis-Chalmers Company as sales engineer, connected with its New York office, has recently associated himself with the Terry Steam Turbine Company and A. L. Ide & Sons as district sales manager for each firm in the Middle West, with offices at 814 People's Gas Building, Chicago, Ill. Mr. Peck was prior to 1902 actively connected with the machinery sales field of Chicago, and since that date, for three years, was manager of the Milwaukee district sales office of the National Electric Company, going from Milwaukee to the Allis-Chalmers Company at New York in 1905. He was graduated from Purdue University in the class of 1892, with the degrees of B.M.E. and E.E., and is an associate member of the American Institute of Electrical Engineers.

BUSCH, SULSER BROS., DIESEL ENGINE COMPANY.—A list of some of the users of Diesel Oil Engines has been distributed by the Busch, Sulser Bros., Diesel Engine Company, St. Louis, Mo. The list contains the following names and ratings of engines: Sherman, Tex., Gas and Electric Company, (675 hp); South Norwalk, Conn., Electric Works, (675 hp); Bellefontaine, Ohio, Electric Light Plant, (450 hp); Atlantic Light and Power Company, Coeymans, N. Y., (240 hp); Mansfield, Mass., Electric Light Company, (465 hp); Citizens' Electric Light and Ice Company, Lebanon, Ind., (570 hp); Effingham, Ill., Electric Light and Power Company, (465 hp); Camden, N. Y., Electric Light Plant, (170 hp); Westerly, R. I., Light and Power Company, (1125 hp); Abilene, Tex., Light and Water Company, (450 hp); Camden, S. C., Ice and Light Company, (395 hp); Pittsfield, Mass., Electric Company, (450 hp); Claremont, N. H., Power Company, (900 hp); Bryan, Ohio, Light and Water Works, (450 hp); Gloucester County Electric Co., Pitman Grove, N. J., (225 hp); Ennis, Tex., Ice, Light and Power Company, (350 hp); Cleburne, Tex., Gas and Electric Company, (450 hp); Robinson, Ill., Light, Heat and Water Company, (225 hp); Key West, Fla., Electric Company, (825 hp); Thibodaux, La., Electric Plant, (240 hp); Menasha, Wis., Water and Light Works, (150 hp); Baldwin Locomotive Works, Philadelphia, Pa., (1350 hp); International Time Record Company, Binghamton, N. Y., (120 hp); Kent Manufacturing Company, Clifton Heights, Pa., (225 hp); Samson Cordage Works, Shirley, Mass., (900 hp); Trinity & Brazos Valley Railway Company, Teague, Tex., (465 hp); Grinnell Mills, New Bedford, Mass., (450 hp); Ball Bros. Glass Manufacturing Company, Muncie, Ind., (675 hp); Knabe Piano Company, Baltimore, Md., (225 hp); Gorham Manufacturing Company, Providence, R. I., (450 hp); Airedale Mills, Pittsfield, Mass., (120 hp); Prairie Pebble Phosphate Company, Mulberry, Fla., (3600 hp); Texas & Pacific Railway Company, Marshall, Tex., (225 hp); American Optical Company, Southbridge, Mass., (1350 hp); Grant Yarn Company, Fitchburg, Mass., (450 hp); Fisher Manufacturing Company, Fisherville, Mass., (450 hp); United States Naval Torpedo Station, Newport, R. I., (225 hp); Kimberly-Clark Company, Neenah, Wis., (1020 hp); Columbia Worsted Mills, Wallingford, Pa., (170 hp); Anheuser-Busch Brewing Association, Bronx Ice Plant, New York, N. Y., (570 hp); United Verde Copper Company, Jerome, Ariz., (450 hp), and United Gas Improvement Company, Philadelphia, Pa., (825 hp).

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JULY 18, 1911.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

997,953. ELECTRIC GARMENT PRESSER; J. Bloch, Cincinnati, Ohio. App. filed Oct. 17, 1910. A pair of tubes for containing incandescent lamps. The article to be pressed is drawn between the tubes.

997,954. ELECTRIC PRESSER FOR NECKTIES AND OTHER ARTICLES; J. Bloch, Cincinnati, Ohio. App. filed Oct. 17, 1910. A tube for an incandescent lamp and a curved presser plate. The article to be pressed is drawn between the tube and plate.

997,957. TROLLEY HEAD; P. Brandell, Wichita, Kan. App. filed April 23, 1910. The wheel is mounted in bearings on a semi-rotatable support, capable of limited lateral oscillation on the pole. Waterproof bearing.

997,984. ELECTRIC STORAGE BATTERY; B. Ford, Philadelphia, Pa. App. filed Dec. 13, 1907. Inert material, such as lampblack and clay, is incorporated in the active material of a negative plate by precipitation from a deflocculated condition.

997,987. SAFETY SIGNALING DEVICE FOR GAS CONNECTIONS; F. Ferry, Cleveland, Ohio. App. filed Nov. 2, 1910. An inflatable bag operates electric contacts when the pressure gets low.

997,990. ELECTROMECHANICAL SELECTOR; E. G. Godfree, Hampton, Australia. App. filed May 7, 1910. For party line and intercommunication telephones. To prevent interruption. Clockwork transmitter; plug controlled signal; electromagnetic receiver.

997,993. RAIL JOINT; G. C. Hager, Danbury, Conn. App. filed Sept. 24, 1910. Interlocking rail heads with a chamber formed between them containing a flexible rail bond.

998,016. RECORDING MECHANISM FOR METERS; R. C. Lanphier, Springfield, Ill. App. filed March 22, 1911. Distant-operated indicating hand for showing the record of a storage battery on electric vehicles, etc. The hand moves more rapidly on discharge than on charging to compensate for losses.

998,026. PRODUCTION OF PREDETERMINED DISTRIBUTION OF MAGNETIC FLUX IN ELECTRIC MOTORS, GENERATORS AND OTHER APPARATUS; R. D. Mershon, New York, N. Y. App. filed April 11, 1907. A motor is provided with leads for connection with an external alternating-current circuit at a plurality of points for each of one or more poles, the points being located with respect to the arc or arcs embraced thereby to produce a desired distribution of flux.

998,034. SIGNAL SYSTEM FOR ELEVATORS; D. M. Perine, Pitts-

burgh, Pa. App. filed May 4, 1911. Timing mechanism and signal devices to operate a group of elevators on a predetermined schedule.

998,040. TELEPHONE SYSTEM; H. O. Rugh, Sandwich, Ill. App. filed May 16, 1910. Three operative talking circuits from two metallic circuits.

998,043. TELEPHONE SYSTEM; R. C. Smith, Homer, Mich. App. filed Oct. 26, 1910. Substation circuit and apparatus. A manual switch controls the energizing circuit of the transmitter in conjunction with the contacts of the usual switch hook. Party line.

998,063. ELECTROLYTIC CELLS FOR THE ELECTROLYSIS OF ALKALINE SALTS; M. Wildermann, Ealing, London, Eng. App. filed Dec. 10, 1910. Improvement on Patent No. 741,864. Small weights for preventing the carbons floating on the mercury on the cathode side from rising over a certain height and ribs for preventing wave motion of the mercury.

998,067. TERMINAL FOR INCANDESCENT CONDUCTORS; A. C. Appelberg, Schenectady, N. Y. App. filed July 2, 1906. A tungsten resistance stick is held in a tungsten block by a sintered residue of dry powdered tungsten.

998,073. ELECTRIC INSULATOR; G. W. Chaffin, Dayton, Ohio. App. filed Feb. 13, 1911. A screw-threaded supporting pin has a longitudinal opening closed on one side at the end to allow expansion and still preserve strength.

998,112. SUPPORT FOR ELECTRICAL CONDUCTORS; T. E. Murray, New York, N. Y. App. filed April 5, 1911. A V-shaped bar supported in a notch in an upright.

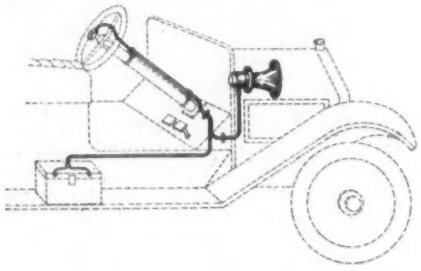
998,117. TEMPERATURE REGULATOR; A. N. Ozias, Minneapolis, Minn. App. filed July 20, 1910. The tension of the movable member of a thermostat may be adjusted to vary the operating temperature. For controlling motor circuits for ventilation and heating.

998,119. ELECTRIC-SWITCH RECEPTACLE; J. G. Peterson, Hartford, Conn. App. filed March 22, 1910. A face plate for a snap wall switch with concealed means for fastening it in position on the receptacle.

998,147. ALTERNATORS; S. B. Allen and E. T. King, Cambridge, Mass. App. filed Aug. 11, 1910. Two contact arms are electromagnetically oscillated to convert direct current into alternating current of high frequency for wireless telegraphing, etc.

998,161. MAGNETIC TELEPHONE; W. W. Dean, Elyria, Ohio. App. filed March 29, 1909. A receiver having its flux conductor made up of E-shaped punchings.

998,162. WARNING-SIGNAL DEVICE; W. W. Dean, North Ridgeville, Ohio. App. filed May 1, 1911. A noise "horn" with vibrating diaphragm and an outlet for foreign matter; adjustable around the periphery.



998,162.—Warning Signal Device.

998,175. METHOD OF AND APPARATUS FOR STARTING AND OPERATING MERCURY-VAPOR APPARATUS; P. C. Hewitt, Ringwood Manor, N. J. App. filed Sept. 15, 1908. A platinum conductor extends above and below the mercury surface so as in effect to provide a turned-up meniscus and facilitate starting at a lower voltage.

998,197. FIRE-ALARM APPARATUS; G. T. Moore, Marlboro, Mass. App. filed June 11, 1909. A sending device having contact plate with a V-shaped slot, a contact arm carried by a rotative shaft and means for adjusting the time of passage of the arm over the slot.

998,212. ELECTRIC-ARC LAMP; S. Szubert, Pankow, Berlin, Germany. App. filed Oct. 18, 1909. A spindle rotated by the current moves a system of levers so as to feed the carbons straight forward and maintain their angle of relative inclination.

998,223. ELECTRIC MERCURY-VAPOR LAMP; J. M. Anck, Philadelphia, Pa. App. filed Dec. 14, 1904. The container has mercury in both ends and is bowed in the center and is rotated on its longitudinal axis for starting.

998,245. CONTROL SYSTEM FOR ELECTRIC MOTORS; J. H. Hall, Cleveland, Ohio. App. filed March 18, 1910. For hoists, etc. The armature and field may be connected in parallel. Two resistances in the armature branch in parallel and means for throwing portions of one resistance over into the field branch and short-circuiting the other.

998,252. AUTOMATIC HIGH-TEMPERATURE-ALARM APPARATUS; J. V. Ludstrom and K. Nielsen, Schenectady, N. Y. App. filed Feb. 16, 1910. A thermometer with terminal adjustable for different temperature limits.

998,260. AUTOMATIC TRAIN-STOPPING DEVICE; F. A. Pierce, Wheeling, W. Va. App. filed March 30, 1907. The main reservoir pressure effects the exhaust of the train-line pressure and the exhaust action cuts off the main-line pressure.

998,269. ELECTRIC HEATING APPARATUS; A. Trepreau, Joinville-le-Pont, France. App. filed Oct. 25, 1910. A series of open glass tubes and resistance wire passing through the tubes.

998,272. COLLECTOR BRUSH FOR TORSION METERS; A. Barr and W. Stroud, Anniesland, Glascow, Scotland. App. filed July 9, 1910. An assemblage of rods, each having straight inner and outer end portions and a bend between.

998,299. ELECTRIC SIGNALING SYSTEM; J. G. Nolen and J. E. Shepard, Chicago, Ill. App. filed May 9, 1908. For watch service and fire alarm. A single telephone or telegraph transmitter serves a building or bea.

998,301. ELECTRIC SWITCH; C. A. Pfanstiehl, Highland Park, Ill. App. filed Aug. 22, 1907. A disc-like casing with a movable contact arm inside and a forked operating key insertable through the wall. For automobile ignition system, etc.

998,302. FIELD MAGNET FOR ELECTRIC MOTORS AND GENERATORS; A. E. Reimers, Kansas City, Mo. App. filed April 28, 1906. Series field coils are wound grooves in yoke arms and other field coils are wound over the arms. To prevent sparking, distortion of the field and avoid cross connections in the series winding.

998,304. TERMINAL CLAMP; J. D. Robertson, Toledo, Ohio. App. filed Aug. 5, 1910. A wire loop with bent ends held in a socket by a pin which may be the terminal of a spark-gap.

998,343. PROTECTIVE DEVICE; V. Karspetoff, Ithaca, N. Y. App. filed June 28, 1909. A time-limit device self-restoring if the abnormal condition ceases within the limit. The speed of a motor varies as the current and the motor is reversed when the current falls.

998,359. HIGH-VOLTAGE INSULATOR; F. M. Locke, Victor, N. Y. App. filed Feb. 26, 1907. A series of insulators arranged in sequence and connected by metal hangers, each secured to the center of an insulator and passing around the edge and secured to the next.

998,361. MOTOR CONTROLLER; C. E. Lord, Milwaukee, Wis. App. filed Oct. 25, 1909. For starting polyphase induction motors by varying the potential impressed on the primary windings. Has a transformer surrounding and mounted on a shaft and a drum on the shaft.

998,364. ELECTRICAL REGENERATIVE CONTROL APPARATUS AND SYSTEM; J. C. Macfarlane and H. Purge, Chelmsford, Eng. App. filed Feb. 7, 1910. A safety winding consisting of a series field winding is provided on the generator element of the motor-generator in the "Ward-Leonard" system to limit the current drawn from the mains.

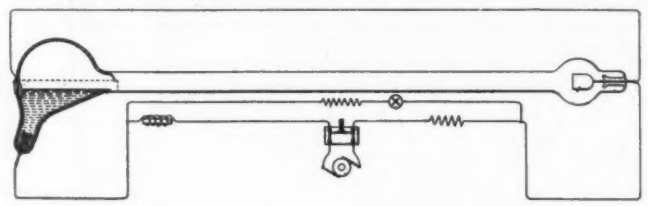
998,379. PROCESS OF ELECTROLYTIC REFINING OF ZINC; K. Namekawa, J. Miyazawa, K. Miyabara and E. Emura, Tokyo, Japan. App. filed March 1, 1911. A lead anode in a zinc sulphate solution. Current is passed from the anode to the cathode through the solution and at intervals a current is passed from the solution to the anode to improve the conductivity.

998,386. COMMUTATOR FOR DYNAMO-ELECTRIC MACHINES; C. A. Parsons and A. H. Law, Newcastle-upon-Tyne, England. App. filed April 19, 1909. The ends of the commutator are supported by their diaphragms connected to the shaft to allow for longitudinal expansion.

998,391. INDICATOR FOR HOTELS AND OTHER PLACES; E. L. Powell, New Orleans, La. App. filed April 4, 1911. The clerk "records" certain facts as to the different rooms and may display all the "records" by operating a key.

998,392. DYNAMO-ELECTRIC MACHINE; H. H. Ralston, Norwood, Ohio. App. filed Oct. 6, 1909. A brush yoke and a single series of radial arms having brush rods for direct-current machine.

998,419. SYSTEM OF MOTOR CONTROL; H. A. Steen, Milwaukee, Wis. App. filed Sept. 22, 1910. A separately actuated contact type of controller has an actuating circuit for each contact controlled by an adjacent contact. A master switch controls the operation of the contacts.



998,175.—Method of and Apparatus for Starting and Operating Mercury-Vapor Apparatus.

998,435. FUSE SWITCH; A. L. Weekes, Harpenden, England. App. filed May 3, 1910. A fuse member is attached at right angles to a switch arm.

998,453. CLAMP; I. Beilis, San Francisco, Cal. App. filed Nov. 22, 1910. A wire device for temporarily holding conductors in a molding while the molding cap is being put up.

998,467. ELECTRIC SWITCH; A. W. Clauder, Bridgeport, Conn. App. filed Feb. 15, 1911. Rotary snap for lamp sockets. A two-part spindle, a cut-out, block thereon having ratchets and independent contact members co-operating with the ratchets.

998,485. AUTOMATIC ALARM; A. C. Farley and W. B. McDonald, Shinglehouse, Pa. App. filed June 3, 1910. Adjustable thermostatic control.

998,486. ELECTROMAGNETIC SIFTER; T. T. Fauntleroy, Staunton, Va. App. filed April 1, 1911. A vertical hollow magnet, a screen and a conical deflector for removing steel particles from flour.

998,493. LOCK FOR FIRE-ALARM BOXES; A. Glock, San Francisco, Cal. App. filed Sept. 13, 1910. To be opened by a "permanent" or a removable key.

998,494. GUARD FOR FIRE-ALARM-BOX-DOOR KEYS; A. Glock, San Francisco, Cal. App. filed Sept. 13, 1910. A swinging latch operated from inside the door holds the glass door plate in place.

998,551. TERMINAL CLAMP; J. D. Robertson, Toledo, Ohio. App. filed Aug. 5, 1910. A wire loop having its ends coiled to engage a conductor and its insulation.

998,552. ELECTROMAGNET; H. O. Rugh, Sandwich, Ill. App. filed March 15, 1910. An armature under the influence of an actuating coil controls means for establishing a closed circuited secondary.

998,564. ELECTROMAGNETIC CUTTING TOOL; Le Roy T. Bonsall, Charleston, W. Va. App. filed March 22, 1909. A coal pick, tandem solenoids, with a switch in a recess between the coils.

998,567. SIGNALING BY ELECTROMAGNETIC WAVES; R. A. Fessenden, Washington, D. C. App. filed Dec. 17, 1906. The antenna has a horizontal portion extending backwardly in the line of propagation of the message to protect the support from useless absorption of waves.

998,580. CIRCUIT-BREAKER; A. L. Horton, Beachmont, Mass. App. filed July 18, 1906. Double-throw oil-tank switch for heavy current. The movable contact is always horizontal. Interlocking devices for the levers. An automatic overload trip and a hand trip.

998,588. FIRE-PROTECTION SIGNAL SYSTEM; J. G. Nolen and J. E. Sheppard, Charlottesville, Va. App. filed April 25, 1904. For use in conjunction with a fire-extinguisher system of Patent No. 993,293. The alarm instrument transmits an "O. K." signal when normal conditions are restored.